THE DETERIORATING ECO-ECONOMIC SCENE

(A reconnaissance view of the Southern Region of Mysore District)

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THE DETERIORATING ECO-ECONOMIC SCENE

A reconnaissance view of the Southern Region of Mysore District

I. G E N E R A L

1. The ecological endowment of a region at a given point of time tells a story extending over millenia and millenia of nature's pristine contribution in terms of soils, water, climate, flora and fauna, and man's efforts to harness and modify these resources for meeting his needs for survival, enjoyment, advancement and multiplication.

2. To those living at the present time after having completed their active years of toil, however, it is the recollection of the ecological endowment they inherited at the beginning of their working life that should be of fundamental interest. Such a recollection would help in an assessment of their performance in the conservation and enrichment (or otherwise) of the resources inherited and deployed for their own ends during their active years of productive career. More important, it would indicate the status of patrimony passed on to their children, who bear the responsibility for its further deployment, conservation and enrichment.

3. From this point of view, it is the recollection of the ecological picture of the late thirties and early forties and the happenings over the subsequent four decades that acquire relevance.

4. In many parts of the world, the early forties - the period of the Second World War - marked the beginning of a break from the past and a drift further and further away from the past in several directions. The most striking in this regard has been man's attitude towards husbandry of nature's resources - soils, water and vegetation.

5. This essay is an attempt at recollecting the eco-economic scene of some forty years ago in the southern part of Mysore District and reviewing the processes that have been transforming this scene since the past four decades. Notwithstanding the immediate gains realised, these processes are being instrumental for a fast deterioration in the ecology of the region. And unless action is initiated with a sense of utmost urgency to check this drift and launch on a systematic and sustained programme of rebuilding the ecological resources base, the damage done by the generation that spent their active years of toil over the past four decades would prove to be the root cause for jeopardising the very sources of life sustenance for their posterity in the region.

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II. THE REGION

6. The southern region of Mysore District is made up of the five taluks of Heggada Devana Kote (H.D.Kote), Gundlupet, Nanjangud, Chamarajanagar and Yelendur (from west to east). The total geographical area of the region is of the order of 5500 sq.kms; and the present population may be placed around a million.

	Geographical area(Sq.kms)	Population				
		1901	1921	1931	1941	1971
H.D.Kote	1608.3	61416	58554			145 068
Gundlupet	1406.2	74897	79524			139 152
Nanjangud	987.8	106895	120727			227 576
Chamarajnagar	1235.9	110196	121487			228 388
Yelendur	264.7	35271	32134			48 803
	5502.9	388675	412426			788 987

Hills of the Region

7. There are two important hill ranges in the region, the Biligirirangan and the Hamavat Gopalaswamy.

8. The Biligirirangan Hills (named after the diety of Sri Ranganatha Swamy at the temple on the top) are situated in the eastern extremity of the region (in the Yelendur Taluk), and partly in the adjoining Coimbatore District of Tamil Nadu. They run from north to south over a distance of some fifty kilometers, reaching a maximum altitude of about 5000 ft. The entire hill range was known for its thickly wooded forests (with sandal wood as a major item) and wild life, especially elephants, bisons and spotted deer, which have, however, suffered severe destruction in the recent decades.

9. The Himavat Gopalaswamy range of hills (named again after the diety of Sri Gopalaswamy at the temple on the top) is in the south-west part of the region, about 12 km from the Gundlupet town. Rising to an altitude of about 4000 feet, the hill is reputed for its scenic beauty. The hill abounds in springs and is generally enveloped in clouds and in mist. The soils are made of argile. The extra-ordinary vendure is attributed to the quality of soils as well as the high moisture content.

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Rainfall

10. Little rain falls in the months of January and February, the cold weather period. Tradition has it that it is not a good augary if the rains break prior to the day of Holi (which generally falls in the second half of February or first half of March).

11. The rainfall during the hot weather period, that is, march, April and May, is generally associated with thunder-storms; heavy rains occassionally accompanied by hailstones are not uncommon. The average precipitation during this period was well over 7 inches in this region (the highest in the State) during the first half of this century. More recently however not only the average precipitation has been showing a lower figure but the frequency pattern of showers itself in defying prediction. The rainfall during this period, however, is of vital importance for agricultural operations to be undertaken before the onset of the South West Monsoon.

12. The South-West Monsoon enters this region at the end of May or beginning of June and lasts about 4 months, and a steady westerly wind blows across the region with occassional breaks in its intensity. During this season, July isthe rainest month, especially for the western part of the region. In a normal year as much as 11 to 12 inches of rain can be expected during this season. In the South-Western part, that is, in the H.D.Kote Taluk the intensity is normally much higher.

13. The retreat of the South West Monsoon commenses sometime in October and is generally accompanied by heavy showers in the eastern parts of the region. The season is popularly known as the North East Monsoon and prevails in the months of October and November, occassionally extending to December. Generally, however, December is a rainless month. The seasonal average for rainfall during this period may be placed around 8 inches.

14. The annual average rainfall in the southern part of Mysore District turned out to be around 30 inches, during the first half of the century. In the more recent period, however, there has been a decline in this average figure.

Rivers

15. The rivers of the region are Kabini, Nagu, Gundal and Suvarnavati.

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The Kabini originates in North Wynad (Kerala) and enters the region at its south-western angle in the H.D.Kote Taluk. It is a fine perennial river averaging from 150 to 200 yards in breadth. Emerging from the thick jungles of Kakinkote, the river flows in the north-easterly direction traversing through Nissen, Sargur, Maygi, Muttikere, Nanjangud and Tayur and joins the river Kaveri at T.Narasipur. In the dry months the body of water in the river is comparable to that of Cauvery. The river swells to impressive proportions during the south-west monsoon, profiting of the heavy rainfall in the Wynad and H.D.Kote catchment areas.

16. The utilisation of Kabini waters for irrigated argiculture remained modest for long with only one check dam (Rampur Anicut) at about 15 kms above Nanjangud feeding the two channels (Hullahalli 36½ miles and Rampur 33½ miles) that irrigate a total surface of some 14000 acres.

17. However, the Kabini Dam at Beechanahalli (H.D.Kote) that has been completed and the canal network that is under construction would bring vast areas(well over 50,000 acres) in the region that are presently cultivated under rainfed conditions into irrigated agriculture.

18. The Nagu, also known as Bhrugu, enters the region from the south west (like Kabini) in the H.D.Kote taluk and flows in the north-easterly direction, joining the Kabini near the Hampapur village (in the same taluk) along the Manantodi Road. Until the mid-fifties, there was just one check dam along the river at Lakshmanapura (sixteen KM above Sargur) accounting for a very modest amount of irrigational facilities benefiting some 470 acres. Since the late fifties, however, with the completion of the Nagu Reservoir at Beeraval (H.D. Kote Taluk) and development of the canal net work covering H.D.Kote and Nanjangud taluks, the total area under Nagu irrigation is well over 20000 acres in the region.

19. Gundal river, emanating from the southern extremity of the region (in the Gundlupet taluk) is of minor importance. A check dam at Halahalli (near Gundlupet) affords some limited facilities for irrigation in the surrounding area. The river flows through the south-eastern part of Nanjangud taluk and joins the Kabini at Nanjangud town after feeding a close-by tank called Narasambudhi. The waters of this tank and the soils around (which were endowed liberally with potash) accounted for the cultivation of bananas of a variety named after the town, which once enjoyed an excellent reputation in the market.

20. Suvarnamati, also known as Haonne Hole originates in the southern hill ranges, traverses the Chamarajanagar Taluk from west to east and then onwards flows across Yelendur Taluk, finally joining the river Cauvery near Kollegal. There are two check dams for Suvarnavati, both built several centuries

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ago. The one at Gajanur, near the village of Attikallipura, feeds the Bandigheri canal; and the other at Hongalwadi, with the canal bearing the same name, feeds the Ramasamudram tank close to Chamarajanagar town.

21. In addition, the farmers of the region engage themselves in setting up temporary dams (in time for capturing the flood waters) and drawing several channels from the river, named after the places at which the canals originate; Sargur, Maralahalli, Alur New, Hemma, Hoshalli, Kudlur, Alur old and Honganur.

22. The total area benefiting of irrigation from the Suvarnavati adds up a total or some 4700 acres, of which Hongalwadi channel (Ramasamudram Tank) accounts for 2112 acres and Honganur for 1793 acres.

Tanks

23. The tank system of the region, as it presents itself today, is no doubt the resultant of the efforts of successive kings and chieftans that ruled ever this land since quite early times in harnessing waters from rivers and rainfall and the rather sad state of neglect in their maintenance over extended intervals of time.

24. The number of tanks (of all types) in the region, as registered in the official statistics of today is an impressive 352, distributed over the different taluks as under:

H.D.Kote	70	Chamarajnagar	50
Gundlupet	127	Yelendur	33
Nanjangud	72		352

25. However, the tanks that are currently is a status of offering reasonable irrigational facilities are just handful. The identification of such a large number of geographical spots as tanks, regardless of their present dis-use, only bears testimony of man's efforts in water conservation and use since the earliest times (here as much as elsewhere). It is also of significant interest in offering locational indications for future programmes in respect of water resources restoration and development.

26. A chronological dating of construction of the various tanks identified would indeed be difficult. But it may be safely conjectured that the earliest civilised inhabitants of the region first occupied the higher grounds and started constructing small tanks (or kattes) on the minor rivulets, and then step by step followed these rivulets down to the larger streams, arresting and impounding the water at every convenient site by throwing bunds across the valley.

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29. The organization that existed in the earlier times, whenever and wherever it functioned, for undertaking the desilting operations (and repairs) of the tanks was indeed most landable. The farmers benefiting of the tank irrigation were obliged to work in the months of February, March and April in disilting the tank bed and repairing the breeches and thus maintaining the irrigation system in an efficient state. As there was practically no cropping operations in these dry months, it was a claim on their free time for their own advantage. In addition, the silt removed from the tank bed was given away to the farmers for fertilising their fields.

30. However, the fact remained that a large number of tanks suffered from continued neglect even in earlier times (the plausible reason as mentioned earlier being constant feuds and break down in administration). Writing the Mysore District Gazetteer over a century ago, in 1369, Lewis Rice commended: "Nothing strikes the observant traveller in Mysore more than the number of old tanks, many of them of great size. Some of them have been out of repair for four hundred years". Further, it has been remarked that the Hyder Ali-Tippu Sultan Regime (1760-1799) witnessed large scale degradation of the irrigation systems in these parts and elsewhere. On the restoration of Mysore Monarchy (1799), Dewan Purnaiah accorded the highest priority in government spending on the restoration of the old tanks and channels. During his brief tenure of office (1799-1811), however, no machinery involving local participation for maintenance on a sustaining basis could be established. The subsequent period of the Monarchy (Mummudi-krishnaraja Wadeyar 1811 to 1831) was marked by continuous turmoil in the northern areas of the state, with hardly any attention paid to these matters by the administration. With the British assuming direct rule of the state in 1831, which lasted over half-a-century (1831-51), "owing to the aversion of the British Government to imposing anything like forced labour on the ryots, no system for counteracting this silting up year by year was on foot, and several tanks had not been cleared within the memory of the oldest inhabitants" (Lewis Rice: Mysore District Gazette Page 8). A system was tried, however, of inducing the tank bed clearance by granting the privilege of fishing, but was given up because of the temptation on the part of the lessee to reduce the water in the tank in order to catch the fish.

31. Since the rendition to the Monarchy in 1381, the State Administration attempted several measures towards the restoration and maintenance of the ancient tank system. Initially the revenue department was entrusted with these

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tasks, which were, however, handed over subsequently to the public works department. Sizeable sums were earmarked under public expenditure for the purpose, but the stress was on the maintenance of embankments and not desilting. With a view to ensuring people's participation, certain legislative provisions such as the Tank Panchayat Regulation Act of 1911 were introduced. The farmers were held responsible for doing the earthwork and bunding so as to keep the bunds to standard condition; and the repairs to stone revetments and masonry were to be done by government. Except in the case of a few large tanks, the operational impact of these policies was hardly discernible.

32. At the turn of the last century, influenced by the achievements in several parts of the European continent in storing large quantities of water by throwing a masonry dam in favourable sites, the emphasis in the state also shifted to "major irrigation works" involving impressive dams across large rivers and huge command areas for irrigation, bringing in its trail a quasi-total indifference towards the maintenance of the tank systems so intelligently evolved in the earlier times. This trend has only gained further momentum all over the country since the attainment of independence and launching of "planned development."

33. Of the 352 tanks (of all types) in the region listed in the official statistics of today, the only tanks that are of some importance in offering irrigational facilities are

1. The "Vijayapuram" in Gundlupet Taluk,
2. The "Honganur" in Chamarajanagaram Taluk,
3. The "Ramasamudra" in Chamarajanagar Taluk, and
4. The "Narasambudhi" in Nanjangud Taluk.

34. The first two among these are dependent on rain; among the other two, "Ramasamudra" is fed by Suvarnavati River and "Narasambudhi" by Gundal river.

Forests

35. The region is endowed with a forest cover all along its western, southern and eastern frontiers bordering the taluks of H.D.Kote, Gundlupet, Chamarajanagar and Yelendur.

(in Hectares)

Taluk	Geographical Area	Forest Area
H.D.Kote	1,94,135	28,475
Gundlupet	1,40,607	48,372
Nanjangud	98,451	3,690
Chamarajanagar	1,23,073	26,902
Yelendur	26,473	10,781
The Region	5,82,834	1,18,781
	100.0	20.2

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36. About one-fifth of the geographical area of the region is categorised as area under forests in the official statistics. It is not known, however, how much of the lands officially classified as forest lands has been turned over for other purposes over the recent decades.

37. In the not too distant past, sizeable segments of these forests ranked among the most dense, the most diverse, and the richest in the country (both in terms of flora and fauna). The following account (reproduced from the "progress Report" of 1869 prepared by the then officiating Conservator of Forests for Mysore) gives the most vivid ecological description of the forest wealth of the region as it existed until the forces of devastation of the recent decades began to exert themselves.

"Between Bisalwadi on the West, and Rampur on the banks of the Nugu on the east, is that portion of Heggadadevanakote taluk which, measuring about 20 miles in length, by from 7 to 10 in breadth, contains the teak forests of Bisalwadi, Kakinkota, Begur, and Aynur Marigudi. Of these, Kakinkota (including Bisalwadi) is naturally a magnificent forest, measuring about 60 square miles; is comparatively flat; and as two streams, the Anape Toru and the Balli Halla, run through it, water is (except in seasons of great drought) to be had all the year round. No roads traverse this forest, and it contains no villages, with the exception of five hamlets (hadis) inhabited solely by Kurumbas. In these five hamlets there are between 30 and 40 able-bodied and men, who are employed by the Mysore Forest Department. Kakankote contains some of the finest teak, honey, and black wood I have seen, but it is said to see the manner in which it has been ever worked. Till a few years ago, teak was sold on a stamp fee in this jungle at 8 annas per tree. Every log that had square to 6 or 7 inches has in some portions been cut down. During the official year 1961-65, the yield of this great forest was barely 5000 cubic feet of teak. It is, however, rich in the better classes of inferior woods. The valuation surveys, which will be commenced during the current year, will enable us to obtain some definite idea of the number of trees. This forest requires great care, and will, if properly attended to, soon recover itself, as young teak is springing up on all sides. The greater portion of the timber produced is conveyed by water to within 25 miles of Mysore".

"The adjoining forest of Begur is separated from that of Kakankota by the Mysore-Manantody high-road and the river Kabini, down which much would is annually floated by the Mysore and Madras Forest Departments, and by several wood merchants. The Begur forests (so named from a small village on the banks of the Kabini) and measuring about 40 square

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miles were, till the commencement of the year 1865, worked by the Madras Department. There are in them six Kurumbi hadis, which furnish between 40 and 50 axe-men. One large jungle road runs through the breadth of the forest from the bordering wynad jungles; along this road the Madras Forest Department conveys its timber to Gundri on the banks of the Kabini, whence they float to Hirinadi, our landing place being Homargalli.

"The yield of teak of these forests may be placed at 6000 cubic feet. There is however a fair quantity of teak coming on, which will furnish a supply for future years. Black wood of good quality abounds. The Southern and Western positions are hilly, and some of the best teak is to be found in the valleys. The slopes are not so great as to prevent the removal of the timber. Water is to be had in the Gumchi Nalla and in the Yeramavina Nalla, all the year round. The whole of the timber from these forests is floated down the Kabini to Homargalli, whence it is carted to Mysore".

"Adjoining the Begur forests is that of Aynur Marigudi measuring about 600 square miles, and at present by far the most valuable of our teack forests. It contains four Kurumba Hadis, furnishing 50 axe-men. This forest is decidedly hilly and to this I partially attribute the fact of its having escaped the fate which has over-taken Begur and Kakankota. Although the river Nugu runs along the eastern fringe of the forest, the bed of the stream is too rocky to admit of timber being floated down. It is also difficult at times to get the wood carts across the river to the road leading to Mysore. The yield of teak of this forest may be estimated for the present at 10,000 cubic feet annually. The supply of water, as a rule, has failed during the hot season".

"Crossing the river Nugu, and passing through some thriving villages, a walk of about 5 miles brings one to the jungles of Berambadi and Bandipur, in the Gundlupet Taluk. Of these two, Bandipur is naturally the richest; and in many parts which have been reserved, young teak is springing up in abundance. Demarcating the reserved portions of these forests will be a work of time, and the boundaries now selected may have to be revised. Neither Borambadi nor Bandipur can be compared to the forests extending from Bisalwadi to Aynur Marigudi, but they are valuable, and with careful conservancy will, some few years hence, take rank as first class forests. Bandipur is the last of the reserved forests; and though still further to the east there is much good wood, especially around Panjur, it has not been thought advisable to reserve any more land in the district".

"From Bandipur up to the Yelendura Taluk, the belt of forest again narrows. Much sandal wood is intermixed with it. Very little teak is found, open glades are frequent, and the country is very hilly.

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(Lewis Rice: Mysore District Gazetteer, 1869 pp 57-59)

38. The Mysore Sandalwood (Linn Santalum album) is rated above those grown in other parts because of its unique fragrance, and is considered most valuable when it is of red colour. The tree thrives best near water, but possesses the greatest fragrance when grown on stony soil. Sandalwood trees are considered to arrive at maturity in twentyfive years, but the 'heart wood' continues to improve in fragrance and quantity for another twentyfive years. Beyond this period decay generally sets in, and a tree has never been known to attain more than sixtyfive years. The pace at which destruction has taken place, in the recent decades, of this precious wealth (through indiscriminate felling and reported smuggling) is a matter for consternation.

39. Apart from the trees specifically mentioned above, the forests of the region were known to abound in a wide variety of trees of exceptional benefit to the local population in meeting their diverse needs for wood, such as fuel, construction materials and rural industries. The more important trees meeting the fuel needs are Dindiga (conocarpus latifolia), Chujjala (albicia amora), Natibage (Albaco lebeck benth), Buruga (Bombax malabaricum), Bilwara (Albicia phodoratins), and Kagli (Accacia ketachu), a wood best suited for charcoal production. Among the trees serving the local needs in terms of building materials are Honne (Pterocorpus marsupium), Nandi (Lagerstroemia lanceolata), Matti (Terminalia tomentosa) and Ala (Ficus bengalenicis). Gobli (Accacia babul) is specially used for the construction of wooden ploughs and rakes, components of bullock carts, and handles for agricultural tools and implements. Dindiga (conocarpia latifolia) and Kakke (casia fistula) offer valuable gum, and Tangdi (cassia auriculata) provides excellent dye material, Marahala (Wrightia tinctoria) and Oodi (oodina wodier) are soft woods used for making toys and sticks for matches and agarbattis.

40. Whereas there has been wide reporting that substantial segments of this forest wealth of the region have been destroyed, especially over the past four decades, only a systematic and scientific inventorying of the present size and status of the forests could reveal the dimensions of the task involved in the process of its rehabilitation and the problems to be encountered in undertaking such an effort.

Trees on the open fields

41. An aspect of tree wealth that is of vital importance to the local rural community (which has, however, not received as much attention in learned discussions as the forest wealth) relates to the trees on the open fields, both

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on the arable lands and the lands categorised as culturable wastes. Traditionally this wealth has been built up by man's careful selection of those species (among the several that were thriving in the local milieu under natural conditions) that were of direct benefit to him in meeting his various needs, and introduction of species brought from outside (such as casuarina) that were of value to him, after testing its ecological adoptability.

42. In the southern part of Mysore District (as in similar other regions), one witnessed a liberal spread of trees on the open fields that were being maintained with great care and judiciously utilised by the farmers to meet their current needs. Apart from the trees growing under natural conditions on the cultivable waste lands that were conserved for community use, the choice of the trees maintained on the private arable lands had great functional relevance in offering on-the-farm resources to the farmer towards meeting his needs in terms of fuel, feed for livestock, construction material, and above all, enrichment of soils fertility through leafy manure.

43. On the open lands classed as culturable wastes (mostly public domain), the trees that were left to grow under natural conditions were generally of the species thriving in the adjoining forest areas, their emergence on these lands being largely a consequence of the seeds dropping by birds, Among the trees conserved on these lands were gobli, kagali, ala and marahala, etc., the species most valuable for meeting the fuel and construction needs of all sorts.

44. On the arable lands were to be found a most meaningful collection of trees maintained by the farmers, generally along the borders dividing each other's holdings, along the borders of the field channels, and even on the fields devoted to annual crops, to the extent the trees did not obstruct crop production. The plantation (or ratention) of the trees followed a well thought plan for ensuring farm self-sufficiency in inputs to the greatest extent possible.

45. Honge (Pongamia glabra) is the most precious farm tree in traditional agriculture, planted extensively by farmers on the bunds dividing each other's fields, and along the borders of field channels in irrigated areas. The leaves of honge are most esteemed for their rich value as green manure, especially for paddy land when cultivated in a puddle. Neem (Melia azadirachta) is the other tree grown, which serves a similar purpose and also builds into the rice plant resistance against pests. Along the borders of field channels and in swampy areas, together with honge and neem are grown gobli, kagli, casuarina, bamboo, etc - trees, as already noted, that meet

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the needs of the farm families in respect of fuel and construction materials. Also, it was not uncommon to witness a liberal spread of gobli trees on the rainfed lands devoted to ragi and jola, since these trees thrive under relatively low rainfall conditions and do not encroach too much into the lands needed for the cultivation of field crops (while offering shade to the animals).

46. Practically all tank bunds, i.e., the unrivetted side facing the fields were planted with honge trees, which served a double function - their roots helping to bind the earthwork and their leaves being used for manure. Similarly, the borders of natural water courses constituting the feeder channels to the tanks and the shallow portion of the catchment were also planted. With the drying up of a large number of tanks in the region (as noted earlier), there has been a corresponding disappearance of this tree wealth, which was such a precious source of green manure to the farms.

47. Tamarind trees were grown on the uplands adjoining the paddy fields and the corner spots of dry lands, which ensured a liberal supply of the tamarind fruit pulp, a vital souring ingredient in food preparation. Only when a tree aged to the point at which it practically lost its fruit bearing value, it was felled for fuel purposes, the tree being reputed for its high calorific value. Jackfruit and mango were the other fruit trees generally planted in these areas, wherever space permitted.

Village Tope and Roadside Plantations

48. An institution of great importance that flourished in this region (as elsewhere) until recently is what is known as the village tope. Each village (and small town) had been endowed with a tope meaning a wood lot which was under the control and management of the village panchayat. The wood lot consisted generally of fruit trees such as mango, jackfruit, jamun, wood apple and tamarind, and fuel trees such as kagli, bilwara and casuarina together with honge, neem, gobli and ala. The principle followed was one of conserving and augmenting the capital stock and drawing upon the supplies for current needs in a judicious manner.

49. Roadside plantations of trees constituted another vital source of tree wealth, not only providing ample shade to the traveller but ensuring steady flow of supplies in terms of timber, fuel, fruits, green manure and animal feed. The access roads to the villages from the main ways were known for their leafy cover, generally of honge, neem and tamarind, looked after by the village institutions themselves; and the avenues along the highways were of the species growing into impressive dimensions, such as ala, bage, neem, tamarind, and jamoon, looked after by the services of state administration.

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50. The importance attached to topes and roadside tree plantations by the administration of a century ago is reflected in an explicit statement in the report on forest areas (of the princely state of Mysore) that "in 1880-81 village topes numbered 16293 standing on 14376 acres, and containing 311,308 trees while 3750 miles of public road had been planted with trees on both sides, at distances varying from 12 to 60 feet".

Grazing Lands

51. The region is fortunate in possessing grazing lands characterised as permanent pastures that add up to a surface that is nearly as much as the area under forests.

	Geographic area (hectares)	Pasture Land (hectares) 1970-71
H.D.Kota	194138	69332
Gundlupet	140607	14242
Nanjangud	98541	10292
Chamarajanagar	123073	18405
Yelendur	26473	2455
The Region	582837	114726

The largest concentration of pasture lands is in the H-D. Kota taluk, accounting for well over one-third of the taluk's geographical area. The taluk, in which are situated the south-western jungles of the region, possesses natural advantages for maintaining good pasture lands even in the hot months - with the moisture in its oils all through the year, early summer showers, and abundance of trees all around offering shade to cattle. The grazing lands of these parts figured prominently in the history of cattle administration in the princely state of Mysore right through the period 1600-1940.

52. Grazing grounds, known as Kavals in the state, are divided into hot weather kavals and cold weather kavals, according to the seasons in which these are utilised. The hot weather kavals are generally the beds of tanks in which grass springs up during the summer months and near which there are trees offering shade. The cold and wet weather kavals, however, are widely spread, offering plenty of grass and water points all through the months June to January but drying up in the summer months.

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53. In the military as well as economic history of the state extending over the past four centuries, cattle, in particular the hallicar breed subsequently named AMRUT MAHAL by Tippu Sultan, played a vital role not only as a source of milk and milk products for the royal establishment and their entourage but as an animal of admirable traction power and speed deployed by the successive rulers (including the British) in their army operations. Large herds were maintained for military purposes; and correspondingly large areas were developed as kaval grounds in suitable regions and maintained under considerable state expenditure and expertise. (For a detailed account see Annexe I : AMRUT MAHAL Cattle).

54. Even after the Rendition in 1881, the Amrut Mahal Cattle Farms continued to serve the needs of the British administration in the neighbouring parts for well over three decades. Since the second quarter of this century, however, the importance of cattle in the military operations tended to disappear; but the State Administration continued to maintain the cattle farms, although with reduced numbers, with a view to supplying the farmers draft animals of high quality. Kaval lands under state management were, however, brought down in size gradually by turning over portions of these lands to the farmers for cultivation. Since the fifties however kaval lands under state management were, however, brought down in size gradually by turning over portions of these lands to the farmers for cultivation. Since the fifties however kaval lands under state management have ceased to exist.

55. In programmes relating to the strengthening and development of pasture resources in the region, identification of the areas that once served as kaval lands and assessment of their potential for regeneration under improved practices would be of great interest.

56. During the period preceding the independence of the country the forest administration in the State used to permit "controlled grazing" in the forest areas which served as a valuable supplement in terms of grazing resources for the local cattle population. In the areas let out for grazing, generally the trees had grown to a height at which no damage could be done by the cattle. To minimise as far as possible the ill-effects of grazing and to check on unlimited use, fees were levied for cattle admitted for grazing in the forests, and grazing season fixed from June to December when owing to the abundance of grasses, least damage to tree growth is expected to result.

57. In the traditional village society, great care was being given to the maintenance of the common grazing ground called the village gomal under the management of the village

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panchayat. All the village cattle, except valuable bulls and cows that needed special care, were collected together in the morning and driven out to the village gomal where tney were grazed. This institution has virtually disappeared in the recent times, the main reason being the shortsightedness of the politicians in power in giving away these "common leads" to private individuals for crop cultivation or house construction.

Animal Wealth

Cattle constitutes the most precious animal wealth of the region playing a multi-dimensional role in the economic life of the rural people. "Cattle manure serves to enrich the soils Carts and bullocks enable the removal of manure to distant fields. The operations of ploughing and harrowing the soil, of sowing and thinning the crop and of lifting water from wells for irrigation purposes are mostly carried on by bullock power. The crop when cut is removed to the threshing floor and trodden out by cattle and the grain taken to the market in carts drawn by the cattle". It is seen that cattle supply the energy input to the farmers of the region practically in all their operations related to production, processing and marketing. And in addition, cows offer to the families milk, the most complete food.

Not much is known of the origin of the indigenous cattle-stock in the region although they still constitute the largest number. But the historical records since the later half of the sixteenth century offer an eloquent description of the efforts made by the successive rulers in the region to introduce superior breeds and upgrade the local stock.*

The principal breeds in the region (other than the village cattle) are the Amrut Mahal, the Mahadeshvara Betta, and the Kankanahalli.

The Administration of the Princely State of Mysore accorded the greatest importance to the breeding and rearing of the Amrut Mahal Cattle. These cattle (comprising three family groups called the Hallikar, Hagalwadi, and Chitaldurg) are of medium size and white or grey in colour. They are quick tempered, active enduring and hardy. The bullocks are best

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*The Karuhatti establishment of the Vijayanagar Viceroy (sometime between 1572 and 1600) at Seringapatam consisted of Hallikar cows imported from Vijayanagar. This may be said to have been the nucleus of the Amrut Mahal Cattle. The Seringapatam cattle passed into the hands of the Wodeyars of Mysore, some of whom notably Chamaraja Wodeyar (1617-1636), Kantivar Narasaraja Wodeyar (1638-53), and the celebrated Chikka Devaraja Wodeyar (1672-1704) made their own additions to them from time to time, assigning kavals in different parts of the kingdom" Mysore Gazetteer Vol.IV p.720

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suited for road work and are capable of quick long journeys under moderate load. They have fine heads, alert ears, long pointed horns; and the compactly proportioned frame, the shapely limbs, and the hard black feet explain their endurance, activity and strength.

The Amrut Mahal cattle were kept in specially selected kavals under an establishment of graziers in low and sheltered valleys on the catchment of tanks, where pasturage and water were available even in the hot weather. The cattle were brought up in a semi-wild state; taming them to work was a specialised operation. The Department held sales of these cattle yearly. Breeding bulls were also sold at concession price to bona fide breeders.

The Mahadeshvara Betta breed came from the jungles and hills near Biligirirangana Betta on the south-eastern frontier of the jungle region. They are larger than Amrut Mahal cattle but are loosely made and not well ribbed up. They have heavy loose-hanging dewlaps, sloping broad foreheads, and large muzzles. They are heavy but slow animals.

The Kanakanahalli breed came from the part bearing that name in the south-eastern segment of the Bangalore District. This breed have thick horns, broad sloping foreheads and white thick skins.

These two breeds were raised wholly by private breeders, the chief breeding tracts being along the banks of Cauvery and Arkavati. The jungles and river margins afforded good pasturage and water. Breeders had their own kavals in which the herds were kept in the open. Ten months to one year old bull calves were bought from these breeders by the farmers and taken to their villages, far and near, to rear.

In addition to the large breeders of these areas, small farmers all over kept one or two cows, generally of the Hallikar breed, and put them to bulls of proven merit and good quality. Great care was taken in the keeping of these cows; they were never let out with the other cattle but tethered and grazed under the eye of the breeder and led home in the evening.

The annual jatras at many of the sacred shrines were also the great cattle fairs where cattle were brought for sale in large numbers.

The size of cattle population was largely adequate in relation to the needs of the farmers in the region for their crop production and related activities. And in respect of ensuring sufficient and nutritive feed for the cattle, the farmers displayed great ingenuity in supplementing the grazing resources with a steady flow of feed supplies from crop production itself all through agricultural year. "The fodder

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jola often sown as a mungar crop, the green grazing afforded by the ragi thinnings, the grazing of the field margins which were for this purpose kept very large about 20 feet to 30 feet broad, jola grown as akadi or mixed crop, the haulms of avare, and horsegram - all provided a succession of green feed through the season favourable to the rearing of superior cattle". Paddy straw and horse gram stocked at the harvest time served a staple source for stall feeding of the cattle in the summer months.

Buffaloes are not of major importance in the region. They are kept essentially for milk production. The Hullu a native breed, is the most common; the female has a calf every year and gives milk for seven months. The largest part of milk production in the region consists of buffaloe milk; and bulk of the milk produced is processed into butter and marketed in the major towns of the region. Butter milk (the residue after churning milk into butter) constitutes the most precious nutritive food to the rural families. Marketing of fresh milk has been traditionally on a limited scale, meeting only the needs of the affluent families and eating establishments in the towns.

Livestock Population 1971 Census

	Cattle	Buffaloe	Sheep	Goats
H.D.Kote	104 653	10346	14 023	36 719
Gundlupet	76 353	9148	24 521	23 310
Nanjangud	90 480	17619	32 036	24 448
Chamarajanagar	76 079	16370	29 842	19 562
Yelendur	12 998	3959	6 265	2 972
The Region	360 563	57530	86 687	107 011

Relative to the size of cattle population of the region, sheep and goats again are of minor importance. The taluk of Nanjangud appears to possess the largest number of sheep and goats in the region.

Apart from the importance of the main products sheep and goats offer in the form of meat, skins and wool, the excreta of sheep and goats are highly esteemed as manure and are much sought after. The great majority of the farmers in the region are arable farmers who keep no sheep and goats at all or only a smally number. Herds are kept by a special class of agriculturists called Gollars (graziers) at whose farms considerable manure accumulate and is often sold to the farmers round about. The gollar farmers are reputed to be highly successful farmers mostly on account of the large quantities of sheep manure they are able to utilise for their fields.

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The larger arable farmers who also possessed sizeable flocks of sheep and goats in the earlier days sent these herds under the graziers to roam about the jungles during the cultivating season; and the herds used to be brought back soon after the harvest and folded on the fields where the green stubble afforded some pasturage, with a view to deriving the benefits of their dung droppings to the fields.

It is a common practice even in recent times for farmers to hire herds of sheep to be folded on their fields soon after the harvest, the consideration being not only the free grazing of green stuble but more often, a money payment for folding the sheep and goats on the field at night.

What emanates from the description in the preceding paragraphs of the water resources, forests, farm trees, pastures and animal wealth in the region is an understanding of the admirable systems of ecological resources management that the rural societies (and the governments that ruled over them) had evolved. The systems represented not only the knowledge acquired through generations in the husbandry of the natural resources that the milieu offered but a deep sense of the importance of conservation of ecological capital and its rational use (with a view to ensuring a steady flow of all the essential inputs for crop production and related activities on a sustained basis year after year). The economy of the region was based on a high degree of self-sufficiency in the resources base; and the new elements introduced from outside such as the superior breed of cattle and fuel trees such as casurina were meaningfully assimilated into the capital stock towards strengthening the resources base. (This is not to deny however that whereas resources management at the farmer's level was maintained at a high level of efficiency systems of management of community assets such as tanks and common grazing grounds were often disappointing).

III. TRADITIONAL SYSTEMS OF CROP PLANNING AND CROP PRODUCTION

Out of the total geographical area of 582 834 hectares, arable land of the region constitutes 261 559 hectares (45 per cent), which may be considered as significant. Net area sown at present is of the order of 221 000 hectares.

Area under cultivation (hectares)

	Gaog area	Net area sown	Fallow land	Total arable land
H.D.Kote	1 94 185	38 794	11 248	59 042
Gundlupet	1 40 607	58 930	9 166	68 096
Nanjangud	98 451	60 527	7 092	67 619
Chamaraja-nagar	1 23 073	53 633	12 218	68 851
Yelendur	26 473	9 150	801	9 951
The Region	5 82 834	221 034	40 525	261 559
	100.0	38.0	7.0	45.0

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Until the late nineteenfifties irrigated agriculture remained at very modest levels in the region. The arable land was devoted predominantly to the cultivation of food crops under rainfed conditions.

However, the systems of crop planning and crop production were marked by a remarkable ingenuity in the deployment of soils for deriving the best possible combination of advantages in food production. Most meaningful methods of crop mix and crop rotation were practised in raising food crops in a composite manner, which ensured balanced availability in adequate quantities of cereals, pulses and oil seeds to the local population. And the crop residues of the food crops offered liberal supplies of supplementary and nutritive cattle feed, fuel for the rural homes and green manure to the soils. Crop production gave as much importance to crop yields as to conservation and enrichment of soils in a long term perspective.

Ragi (Eleusine coracana) and Jola (Jowar-Sorgham vulgars) were the cereal crops that were most extensively grown in the region under rainfall conditions and these cereals also constituted the staple food of the local population.

On the lands under ragi and jola simultaneously certain varieties of pulses (consumed in the region) were raised under systems of inter-spaced cropping; the most common among them were togari (red gram-cajnus indicus), avare (broad bean-Dolichos lablab) and alasande (Cow-pea-vigna catjang).

In rotation with ragi and jola were grown (in a given agricultural year) certain other pulses and oilseeds. Among the pulses were huruli (horsegram-dolichos biflorus) and kadale (Chenna-Cicer arietinum); and among the oil seeds were Atchellu (gingelly-Sesamum indicum), hutchellu (niger-quizotia abyssinica and nela kadale (ground nut-Arachis hypogoba).

Cotton and caster seed were raised in modest quantities on the rainfed lands with black cotton clay soils in the eastern part; and in the irrigated areas, other than paddy, sugarcane was cultivated on a rather restricted scale essentially for processing into jaggery for local consumption.

On the paddy lands, in the summer months leguminous sowings (such as sun hemp) were interspersed with blackgram, green gram, cowpeas, gingelly, etc. The principal objective was one of ploughing the green matter into the soils at the time of puddling the fields prior to transplantation of paddy but the grains harvested mostly as a catch crop of pulses and oilseeds constituted a valuable source of protein foods and fat for the farm families and afforded some cash income through the sale of modest surpluses.

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Agricultural Seasons

The agricultural year is principally made up of three seasons in respect of rainfed cultivation:

the kar or early mungar season which is the earliest beginning in the month of April or May.

the hain or mungar, the main season beginning in July, and hingar commencing in September or October

In respect of paddy cultivation, the seasons are called karthik and Vaishakh, the former being the monsoon crop sown from July onwards and harvested by December, and the latter sown from December onwards and harvested in April or May. Vaishak crop of paddy was hardly of significance in the region.

Rainfed Crops

The southern part of Mysore district is favourably placed in enjoying the benefits of early summer showers (of local character) under normal conditions. Therefore kar cultivation, the earliest in the agricultural year, played an important role in the traditional cropping systems of the farmer.

The principal crops of the kar season in the rainfed lands of the region were ragi among the millets, gingelly among the oilseeds and jola as a fodder crop. Also a few pulses of major interest to the people, viz., togari, avare, and alasande (cow-pea) were sown simultaneously under inter-spacing on these fields although the maturity of these crops took longer periods extending into the subsequent season.

The farmer made his choice of the kar crop depending upon his order of preferences for ragi, gingelly and fodder jola, and his plans for cropping in the ensuing hain and hingar seasons. On not too small farm holdings say around five acres, it was not uncommon to witness all the three crops sown under distinctly different parcels of land. In respect of pulses to be sown, under inter-spacing, togare was the one most widely preferred in the region.

Ragi, the most favoured staple food of the farmer, was extensively cultivated over deep red loam soils that abound in the region and are best suited for this crop. On good soils that are well manured and under conditions of satisfactory rainfall, ragi offers high yields. But even under poor rainfall the crop survives and bears modest yields, being hardy and drought resistant. The crop is remarkably free from fungus or insect attacks and has excellent keeping qualities. Stories are told of ragi being preserved in good condition for as long a period as forty years.

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The importance of ragi to a farm family in the traditional rural life of the region is best expressed in the following statement:

> "Broadly speaking, it may be said that all dry lands (in the erstwhile princely state of Mysore) are farmed by the owners themselves. Their number is obviously the largest in the state and they also constitute the small holders. The cultivation of ragi, which is the main crop on these lands, has to be looked upon as a means of the people's food supply and not as an undertaking of any commercial value i.e., as venture on which one can invest capital with the hope of earning a fair return on it. Taking a good season with a bad one, the ordinary dry land cultivation is not such that if every item of the raiyat's labour on the crop from the preparation of the land to the marketing of the produce, is valued at market rates for manual and bullock labour, any respectable margin of profit can be expected. It, however, provides food for the raiyat and fodder for his cattle and where the area farmed is not very small, furnishes a modest competence which, combined with his innate desire to cling to his land and his village, and to the profession to which he is born, is enough incentive to keep him on the land. Much capital is not required and with a little cooperation from his neighbours at the busy season, he is just able to carry on".

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Tracts that are intended for kar cultivation of ragi are ploughed traditionally soon after the previous crop is harvested, that is, in the months of September and October. The ploughing is repeated with the early rains of the succeeding year, that is, in the months April and May; and sowing follows next.

Ragi is sown either by broadcast or drilling. In the case of the farmer, the grain at the rate of 10 to 15 seers per acre is sown and covered by working lightly the wooden harrow. If the seed bed is somewhat dry and the soils likely to be blown off, a herd of sheep is driven round and round over the field.

Furrows are then opened up two yards wide for row planting of pulses-togare, avare, or alasande. The seed is sown by hand and covered with the foot. (One row of pulses for every twelve rows of ragi in general). From the fourteenth day onwards interculturing begins on the ragi fields and is

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continued about three times at intervals; as the sowing is very thick, severe thinning is necessary and the hoes effect this thoroughly. The hoeings bring the crop into lines and also pull out weeds and break up the surface crust. Thereafter hand weeding is undertaken, once or twice; and the crop needs no further attention until the harvest. If the growth is luxuriant, it is not uncommon that the crop is lightly grazed down.

From the dateof sowing ragi takes 4 to 4½ months for harvesting. The crop is cut down by the sickle, the unbound sheaves lie on the ground for some three days, and are then put up in field stacks.

At the harvesting time of kar ragi, there are generally rains; harvesting and stacking have to be done very quick, taking advantage of the dry spells. The field stacks are removed close to the threshing time, usually the month of February.

The threshing floor is prepared by cleaning a circular space, loosening the surface lightly, watering it and trampling it well under the feet of bullocks or by means of stone rollers. The floor is well plastered over with cowdung paste, and figures of the farmer's implements such as ploughs, drills, and hoes, and carts are drawn over the surface "amidst much reverent exultation" and the floor is lost to dry.

From the middle of January onwards, as the weather warms up, thrashing is taken up and conducted either by beating out the grain or more generally by trampling it under the feet of bullocks. The grain is then winnowed and cleaned, heaped up when the threshing is all finished, and the heap is worshipped by the farmer and his family. "It is seldom measured, as it is considered inauspicious, but carted home to be stored or sold".

Under these traditional systems, in normal years, the yields averaged to 600 to 700 seers per acre of kar ragi. Yields up to 800 or 900 seers, however, were obtained on lands well manured.

Traditionally the ragi crop was as much important in feeding the cattlestock of the farm families as in providing staple food for their consumption. The straw of ragi is considered best among the cereal straws in the state as cattle feed.

Farm households grind ragi into a fine meal in the household stone mills. Ragi flour cooked into a kind of pudding is the commonest from in which it is eaten together with sauce made of togare, avare, alasande or huruli. It is also consumed in the form of gruels and sometimes it is made into a kind of unleavened bread.

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Next to Ragi in importance is jola as a dry land food crop. But jola is widely grown on the black cotton soils concentrated in the eastern part.

Kar jola is sown very early, sometimes as early as the middle of March but usually by the second week of April.

The preparation of the field for jola does not differ materially from that of ragi except that a very elaborate tilth is not attempted; for the same reason jola can be seen grown even on rough lands, on which ragi is not usually thought of. Jola is sown even on lands imperfectly prepared, the subsequent interculturing being deemed sufficient to make up for the imperfect preparatory operations. In the black cotton soils merely a shallow tilth is given; the land is generally worked with a rake instead of the plough and then manured.

Sowings are generally either in drills or furrows. The custom is to mix jola with cattle manure and sow by hand in plough furrows, covering the seed is done by the rake in the case of drill-sown jola; where sown in plough furrows, seed is covered by ploughing an additional furrow.

Like in ragi fields, pulse crops are interspaced togare being the one generally chosen for the purpose.

After the crop comes up, it is usual to give one ploughing since to each row of jola, which serves to earth up the rows and to collect such water as the rains bring close to the roots of the plants. During the earlier stages the field is guarded against cattle as the tender jola brings on bloating and often death to cattle grazing on it; when the heads appear and until harvest a perpetual watch has to be kept against birds which levy a heavy toll. Tall perches are erected in the fields from which the farmers keep up a great din to scarce away birds.

In 4 to 4½ months the jola crop is ready to harvest; the plants are cut close to the ground and stacked in the field temporarily.

Threshing is done by trampling out the grain under the feet of cattle. The grain is preserved in underground receptacles (as in the case of ragi) while grain intended for seed is preserved in <u>moodes</u> (specially designed baskets).

The stacks form the most important dry fodder for cattle in terms of quantity in these tracks and are put up in substantial mounds and thatched over with the dry stalks of the togari plants.

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The yield of jola grain on the dry lands ranges from 400 to 700 seers per acre.

Jola is eaten either by grinding into flour out of which unleavened bread is made or is broken and cokked like rice.

Gingelly is the other important kar crop sown soon after the early rains, especially in the western part of the region where this accounted for the heaviest acreage. It is sown largely on the red loams and on the soils inclined to be sandy.

The dry land fields intended for gingelly are ploughed and kept ready for the crop quite early in the season in the manner done for kar ragi. The black seeded variety of the grain is the one generally cultivated.

Gingelly seed being very small in size is mixed with earth, ashes or mouldy ragi (from underground storage bins) and then is sown either broadcast or in drills. The fields are hoed with the harrow and are also hand-weeded.

The crop is ready for harvest in three months (i.e., early July). The plants are then pulled out and taken to the threshing floor. Threshing is exceedingly simple; the bundles are shaken upside down so that such of the capsules as have opened in the field itself shed the seeds. The bundles are stacked for a few days until all the capsules dry and open; they are then shaken and also beaten to get out all the seed. At the thrashing floor, the seeds get mixed with a lot of earth and gravel and therefore require much winnowing and screening out.

An acre of land under gingelly in the region would normally yield about 200 seers of seed. It has to be noted however that the crop is somewhat delicate.

The seed is used principally for the extraction of oil which is most preferred among the edible oils used by the local people.

The oil cake is a highly priced cattle feed and largely fed to milk cows and buffaloes.

Gingelly is known to be a soil-exhausting crop. Therefore, the choice of the crop for the subsequent season on these lands has to be such that it has the properties of rebuilding the soil fertility (horse gram).

The dry lands that could not benefit of the kar cultivation of ragi and jola (beginning in April and May) are brought under these crops in the hain or mungar season which

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is the main cropping season in the state, marked by the onset of South-west Monsoon sometime by middle of June. The methods of land preparation, sowing, cultivation, and harvesting are identical to those of the kar crops. Only the harvesting is delayed by a month or six weeks because of the delayed sowing. It has to be noted, however, that the yields of the hain crop are generally lower than that of the kar crop.

Upon the completion of harvesting of the mungar crops (essentially of ragi, jola and gingelly), these lands are ploughed, sundried and brought ready for the sowing of the second crop in the hingar season beginning in September or October (marked by the North-East Monsoon). Horsegram (huruli) is the most extensively grown crop on these fields, with the rows of pulse crops of togari, avare and alsande standing intact and pursuing their growth.

The sowing time is in the months of September and October. Sowing is generally by broadcasting; the field is then ploughed upto cover the seed. But sowing in plough furrows with a view to inter-culturing is also common. When the crop grows rank, it is lightly grazed down.

A large quantity of green material, both stacks and pods, is removed as green feed to cattle and sheep. The crop is ready for harvest in 3½ months and pulled out and stacked. Threshing is under the stone roller, but beating out by sticks and trampling out under the feet of oxen are also common. The husks, chaff and the straw are all fed to cattle.

About 200 seers of horsegram per acre may be considered as the average yield.

Horsegram is chiefly used as the main concentrate feed for the working cattle. It is also a popular pulse with the farmers for their sauces that go with their staple fool of ragi or jola.

In the earlier times the production of horsegram in the region was so large relative to the local human and livestock needs that sizeable quantities were being regularly exported.

Together with horsegram, it is a common practice to raise niger (hutchellu) in neatly interspersed rows. This crop also matures at the same time as horsegram, in 3 to 4 months. About the month of November it strikes as a most conspicuous crop in the dry fields with its showy yellow flowers standing cut in rows.

When the flower the crop furnishes along with a lot of other green material excellent green feed for cattle and sheep. As the crop matures, the plants are cut down at the base and then stacked. They are spread out to dry and the seeds are beaten out and winnowed out of the shaft.

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The pulse crops togari, avare, and alsande planted at the beginning of the mungar season arrive at maturity about the middle of January (long after the harvesting of ragi and jola) at the time the hingar crops such as horsegram are also ready for harvesting.

When mature these plants are cut at the base, stacked and brought to the thrashing floor. In the case of avare, from November-December onwards the green pods are picked and sold as a vegetable. The crop is harvested when the pods are dry. These pulse crops are thrashed out by piling the crop in a thick layer and beating out with stick.

The haulms form excellent cattle feed together with empty pods and chaff. The dry plants are used as fuel and to some extent for making cart hurdles and for thatching jola stocks.

Togare is the most important pulse that enters into consumption together with rice in the diet of the more affluent families.

Bengal gram called kadale is another pulse grown in the region. Unlike togare and avare, this pulse is always grown pure, that is, by itself, in the hingar season. It is a cold weather crop and is sown late in the north-east monsoon i.e., from October onwards up to December. On the black cotton soils, it follows cotton. The crop comes to maturity in 3 months. The heavy dews of the cold months of December, January and February are said to be greatly beneficial to the crop.

Considerable quantities of the crop are sold when it is partially ripe to be eaten green or cooked as a vegetable. When dead-ripe the plants are pulled out and the pulse beaten out on the thrashing floor.

The pulse is eaten in various ways, fried whole and salted, parched and spilt, or ground into a flour; it is fed to cattle as concentrate food, softened by soaking in water.

Among the other crops grown on drylands of the region, the more important ones are groundnut, cotton, and mulbery.

Groundnut cultivation made its appearance in the state only towards the end of the last century; but the pace with which its cultivation extended itself in the state over the first half of this century has been remarkable.

The land intended for the crop receives a good preparatory tillage in the early monsoon rains; sowing is in July for the long season variety, and May for the early maturing variety. Seeds are sown in plough furrows about one foot

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apart and about 4 inches from each other in the rows. The crop matures in 3½ to 5½ months according to the variety. In the case of the early maturing varieties harvesting is relatively easy since there are rains at the time rendering the ground soft. With the long duration varieties, the harvesting is at the time when the rains are over and the ground becomes very hard. However, the letter maturing varities yield on an average around 400 kg., higher than the early ones that yield only about 250 kg.

The pods are dried well before they are sold; the haulms are fed to the cattle if the crop is harvested in time. With the local preference being for gingelly oil, larger part of the groundnut production used to be exported. To the extent the seeds were pressed for extracting oil, oil-cakes served as excellent protein feed for cattle. The oil-cakes were also used as precious manure for highly remunerative crops such as sugarcane and fruits.

Cotton cultivation in the region has been traditionally on the black cotton soils of the eastern part. The land is ploughed with the first heavy rains in the months of May and June, and well manured with cattle manure. The seed is sown in the month of August, the standard variety being known as the Nadam cotton of Coimbatore-Gossypium berbraceum. The seed is prepared by rubbing up with wet earth and cowdung which makes the fluff adhere to the seed. Sowing is generally through a two tined drill, a saddle being tied behind each tine. After the plant is well above ground, inter culturing is given thrice at well-timed intervals.

For three months from February onwards picking go on, usually three in number, as the boils are in different degrees of ripeness and do not therefore open up at the same time. The average yield is around 5 quintals per acre.

The origin of mulbery cultivation and sericulture in the state dates back to the era of Tippu Sultan, about two centuries ago. In an address to the special representatives of trade in the year 1733. Tippu Sultan is reported to have observed:

> "Our economic and commercial policies must be based on growth and dynamism. It is not enough merely to improve our methods of production of the traditional items. We must diversity into new fields of activity suited to the richness of our soil and genius of our people. Let me mention two or three avenues in which real progress is possible. I have given detailed instruction to the establishment of silk industry in Mysore. Silkworms and men well versed in the art of rearing them have already arrived from foreign lands to train up our people. Eighteen centres have been set up for the development of the industry, many more are needed. Every encouragement is being given to plantation of mulbery leaves. I would like you to take direct interest in this development activity. My goal is clear. I want Mysore to be foremost amongst silk producing nations".

(K.Puttuswamaiah: Economic Development of Karnataka Vol.I p.642).

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Silk rearing as a cottage industry supported by mulbery cultivation for feeding the silkworm has received continuous patronage of the state since these times.

The mulbery (morus indica) crop was established as an irrigated crop in different parts of the princely state of Mysore, notably in the taluks of Channapatna, Closepet (Ramanagara), Siddlaghatta, Kolar, Chikkaballapur, Hospet Kunidal and Mandya. But in the eastern part of Mysore District in the taluks of Chamarajanagar, Yelendur, T.Narasipura and Kollegal, the cultivation was developed essentially as a dry land crop on the heavy black cotton soils, with yields far below the yields under irrigation.

The dry land mulbery can be grown only on the heavy black cotton soil that retains sufficient moisture to keep the crop alive through the hot months. The land intended for this cultivation is usually dug about three feet deep prior to the onset of summer season in order that the clots dry until the advent of rains. These are then broken, grass and other weed roots removed out of the soil, and cattle manure added - about 50 cart loads per acre. Thereafter the soil is reduced to fine tilth.

The variety of mulbery grown in the bush type, which seldom attains a height more than five or six feet. Two kinds are grown mixed together; one is distinguished by a white stem and the other has a dark green stem. The plant stands on the field for a period of 15 to 25 years practically under monoculture.

Notwithstanding the patronage of the earlier rulers to the mulbery cultivators, the area under cultivation remained modest until about four decades ago. Subsequently, however, the highly attractive markets for pure silk as well as the extended governmental assistance to sericulture have been instrumental in a phenomenal expansion of area under mulbery cultivation, bringing in its trail quite serious ecological and socio-economic problems (see below).

Wet Land Cultivation

Rice is the most important wet land crop in the southern part of Mysore District, grown under conditions of irrigation assured by the canal and tank systems. Until mid-fifties, however, the area under cultivation remained modest well below 15 000 acres in the region, with the largest part belonging to the H.D.Kote and Nanjangud taluks.

Traditionally rice cultivation in the region is only in one season of the agricultural year - the hain season (beginning with the monsoon in June-July and extending to the winter months of November - December).

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The paddy fields are ploughed up soon after harvest as soon as the field is in a fit condition for ploughing. (The brief interval after harvesting and prior to ploughing is the period when cattle, buffaloes, sheep and goats are let on the fields to graze the stubs that are still green, in order that the fields benefit of dung droppings).

Immediately after the first summer rains (Bharini) sometime in the middle of April, a mixture of sunn hemp, horsegram, cowpea, greengram and black gram is sown. By about the month of July, the pulses are ready to pick; and a more or less fair crop is harvested according as rains have been good or indifferent. It is then partly fed of by bullocks and the reminder is ploughed into the puddled field.

In the months of June water is let into the fields and the green manure crop is trampled in. The crop rots for a week when the fields are ploughed again under puddle. Together with this green crop, the fields are fertilised with the cattle manure carted from the village manure pits, silt gathered from the tank and canal beds, and green leaves from the honge tree (pangamia glabra), the most esteemed green manure. Also, in lesser quantities, leaves of neem (melia azadirachta), tangadi (cassia auriculta), and yekka (calotropis gigantes) - which is said to cure alkalinity.

After the puddle is levelled and bunds are trimmed, seedlings about 25 to 30 days old (raised in the seed beds prepared in advance) are transplanted in bunches from 4 to 15 plants at close intervals. Water is let in scantily till the yellow of the transplanted seedlings changes into a deep green after which the field is kept continuously irrigated till about 10 days prior to harvesting when the water is stopped.

Hand weeding of the fields is done generally by female labour about one month after transplantation. Harvesting of the traditional varieties is usually after 4½ to 5 months from the date of raising the seedling in the nursery bed. Average (gross) yield of paddy in the region under reasonably efficient methods of traditional cultivation is generally of the order of 20 pallas (17 quintals) per acre.

Sugarcane is the only crop other than paddy that is of some importance on the irrigated lands of the region, mostly under large tanks where year-round irrigation is assured. (Wells are also dug to supplement tank waters, and in some scattered areas as an independent source of irrigation for cultivation in small parcels). The quantities grown are however modest and are intended mostly for processing into jaggery.

The general rotation is of sugarcane and paddy; but irrigated ragi and jola also enter into the rotation. And, it is a general practice to take a catch crop of vegetables, such as raddish, onions and greens under the young cane in the first three months after planting.

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Among the varieties traditionally grown, pattapatti a red and white striped cane is the most favoured. This matures in 12 months, the juice has a high sugar content, and the cane yields a good quantity of jaggery. It responds well to manuring and irrigation yielding as high as 400 maunds (40 quintals) of jaggery per acre. It is said that this variety was introduced into the state from Vellore during the regime of Tippu Sultan by one Mustapha Ali Khan, Pay master of the forces.

The land meant for sugarcane is given very thorough preparatory tillage. The land is ploughed several times, worked with the rake and harrow, and the weeds and stubbles gathered and burnt. The clods are broken by mallets, and sand or silt carted and ploughed in. Sheep are folded on the land, and cattle manure applied usually at 30 to 60 cartloads on acre.

The most common season for planting is February and March. (An October planting is also done occassionally). The crop is propagated generally from sets or cuttings. The sets consist of pieces of cane, each with three eye buds and usually about a foot long. Irrigation is given immediately after planting either by hand watering in the case of pit planting or by furrow irrigation in furrow planting.

Soon after planting, hand weeding is done, which is repeated asoften as necessary. When the canes are three months old, oilcakes (principally of honge), honge leaves and honge flowers are applied to the soils. As the crop acquires height, the canes are supported by earthing them up at the base and forming into ridges. The furrows in between serve as water channels.

The crop matures in from 10 to 13 months depending upon the variety. The cane is cut with a sharp sickle, one or two inches above the ground. The dry side leaves are stripped off with a sickle and the green top leaves removed for fodder. Two or three of the young tops or internodes are removed and kept aside for being used as seed sets. The cut cane is tied into head-loads or cartloads and transported to the jaggery making centres.

Ground Water Utilisation

Ground water use in the region has been on a limited scale so far, utilised mostly for raising coconut plantations. The extent of utilisation of the ground water potential, however, has been relatively high in the eastern part of the region, in the taluks of Chamarajanagar and Yelendur - largely in the areas adjoining the banks of the Suvarnavati river. The topographic formation here permits a water table (perinnially charged by the seepage of the river waters) within easy reach from the ground surface. The exploitation has remained mostly through shallow dug wells; and the installation of pumpsets has not been significant.

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(As on 31 March 1976)

Taluk	Potential number of feasible wells	Number of existing wells	Balance number of feasible wells
H.D.Kote	13 686	275	13 411
Gundlupet	2 549	757	1 792
Nanjangud	2 596	737	1 859
Chamarajanagar	3 680	1 685	1 995
Yelendur	1 049	516	533

In many of the garden lands possessing shallow wells, coconut plantation is raised all by itself; but again in the taluks of Chamarajanagar and Yelendur, in the gardens adjoining the river banks of Suvarnavati that benefit of silt-laden flood waters during the monsoon, coconut plantation is effectively combined with that of betel nut. It is not uncommon, however, that the coconut gardens are bordered by an admixture of fruit trees suited to the milieu such as mango, jack, guva, sapota, lemon and tamarind.

Coconut trees begin to bear yield from the 7th year; but it is from the 10th year onwards that the yields get stabilised. The yields continue over a period of 80 to 100 years. In well maintained gardens enjoying reasonable irrigational facilities, it is common to obtain a yield in the range of 150 to 200 nuts per year.

Apart from the highly nutritive value of the nut (and attractive cash income through sale), the byproducts of the crop in terms of coir (for making ropes to draw water from wells, mats, baskets, etc.,), thatching material (for construction of homes, barns, cattle sheds, etc), and the dried wastes for fuel are of considerable importance to the life of the rural people. Above all, the tree constitutes a precious income-yielding capital asset to the farm families and thus offers them a strong sense of economic security. The tree is refered as Kalpa Vruksha.

The traditional systems of composite rural activity in respect of ecological resources management, livestock raising and crop production described above broadly characterised the region until the beginning of nineteen. The economy of the region had remained largely self-contained, with exports consisting essentially of timber and imports restricted to a few consumer items such as sugar, salt, kerosene and textiles in modest quantities.

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IV. THE CHANGING ECO-ECONOMIC SCENE

Pressures from outside on the resources of the region (with their attendant impact on the ecological endowment and rural life) made their beginnings in a big way during the Second World War; and over the subsequent periods, especially after the attainment of the country's independence (and the integration of the princely states into the Indian Union), forces of change have been operating with high intensity and in quick sequence in this region (as elsewhere). Not only the traditional systems are fast losing ground but the cumulative impact of these forces of change on the eco-economic life of the region has already begun to manifest itself in a manner as to cause serious concern.

In analysing the processes of change in the eco-economic scene of the region, it would be meaningful to trace the factors responsible in the following sequence:

1. The forces instrumental for denudation of the forest lands;

2. The disappearance of the village gomals and kaval lands and the general neglect of grazing resources;

3. The opening up of new command areas for irrigated agriculture;

4. The introduction of new technology in paddy cultivation;

5. Encouragement to double cropping of paddy;

6. The progressive enlargement of dry land mulbery cultivation;

7. Government indifference to draft cattle stock and encouragement to cross-bred cattle for dairying; and

8. Large sized industrial undertakings enjoying access to forest resources as well as crop residues of the region.

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The Forces Instrumental for Denudation of Forest Lands

Forest administration in the Princely State of Mysore enjoyed for long a reputation for its general policy of conserving and augmenting capital stock and pursuing a system of controlled felling conforming to the principles of "yields on a substained basis".

Forests of the Southern Part of the Mysore District were being particularly admired for their systems of husbandry. However, with the installation of the charcoal based Ferro-Alloys Plant at Belagola (near Mysore city) by the state government in the late thirties, there was already in apprehension that the plant necessitated firewood felling in the nearby forest areas at a rate that was considered as more than permissible. And with the spread of the Second World War into the South East Asian Region, the exigencies of the war led to a further relaxation of the forest regulations. The difficulties in speedy procurement of adequate petroleum supplies for army vehicles compelled the British to resort to the use of charcoal fired vehicles on an increasing scale; and this in turn led to large scale felling of firewood trees in the forest areas of this region (as in similar other regions in the country).

The felling of trees in the forest areas of the region beyond the desirable rates made their beginnings in such specific contexts in the late thirties and early forties. Subsequently, however, no attempt was made to revert to the earlier systems of strict husbandry in respect of forest resources. On the contrary, government acquiescence became only too apparent in the commercial exploitation of the forests of the region in an indiscriminate manner.

Over the past four decades, the progressive extensions in road network linking more and more of originally inaccessible forest lands with the urban centres (and the attendant expansion of truck movements engaged in transporting forest materials), the ever-rising demands of the urban (and semi-urban) centres with their fast expanding population for charcoal, firewood and construction timber, the proliferation of industrial units - manufacturing plywood, packaging materials veneers and wooden furniture, the abuse on the part of the contractors authorized to mobilise minor forest products (intended principally for exports), and the government policies in granting concessionary rights to paper and polyfibre interests for exploitation of forest resources regardless of the cannons of forest husbandary have all been responsible cumulatively for a massive denudation of the forest resources in the region (as in similar other parts inside the country).

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After the integrationof the Princely State of Mysore into the Indian Union and the establishment of the government in the State in the framework of the constitution of the Indian Republic, the Government itself has been instrumental for the shrinkage of the areas under forest in the State. Sizeable areas originally belonging to reserve forests have been encroached upon, deforested, and given away for arable purposes or housing settlements togroups of private beneficiaries (especially in the taluks of Chamarajanagar and Yalendur in the region).

The extent of erosion of the forest capital stock of the region could be guaged by the trends in auction prices of timber in the region. The Wynad teak (the species abundant at one time in the not too distant past in the taluks of H.D. Kote and Gundlupet) is an instance in point. The price of Wynad teak per cubic foot at the government auctions was around Rs.5/- in the early forties, Rs.10/- in the early fifties, Rs.20/- in the early sixties, Rs.35/- in the early seventies, and is currently around Rs.180/-. Marketing of supplies on the basis of 'sustained yields' ceased to be of importance in the forties itself; and supplies to the auction markets started coming out of the capital stock. The abnormal price rise over the seventies is only a reflection of the degree of exhaustion of the capital stock itself in the wake of growing demands.

Similar is the story in respect of all the other forest trees described earlier (Nandi, Matti, Honne, Kaggali, etc.).

The disappearance of the forest cover over vast areas is having its impact on the rainfall; it has been widely observed by the inhabitants of the region that there has been a pronounced change in the rainfall pattern. Whereas in the period prior to the forties the region (particularly the western part) benefited of the first local summer showers usually in the second half of March itself, in the recent times the first summer showers get delayed to as late as end April or early May. Also the frequency as well as the intensity of the summer showers has been considerably reduced. As a result, many farmers of the region are hesitant to venture into raising kar jola and ragi crops, an established practice of the earlier times.

The impact on the grazing resources has been equally significant. With the decline in the forest lands, there has been a corresponding decline in the availability of the grazing resources under the forest lands, an important facility enjoyed in the earlier periods under controlled grazing systems.

The Survey of India Maps for the Region are available for the period representing the end of the last century. And it is stated that similar maps have been established for the recent period around the year 1973. It would be useful to undertake an exercise of comparison of the maps of the two periods to assess the nature and extent of the forest degradation in the region.

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The Disappearance of Village Gomals and Kavel Lands and General Neglect of Grazing Resources:

In the traditional systems of ecological resources management in the region, efficient maintenance of village gomals and kavals grounds together with controlled grazing facilities in the forest lands ensured liberal supplies of feed to the cattlestock (the dominant component of the livestock of the region) as well as buffaloes, sheep and goats. The gomals were being managed by the village panchayats; and the interest evinced by the State in the maintenance of Amrut Mahal Kaval Grounds has been noted earlier. The local cattle had access to these State Kaval grounds once the needs of the state cattle were adequately met. In addition considerably large areas under public domain known as culturable wastes were available for grazing by local cattle; and such areas especially in the vicinity of tank beds were of exceptional benefit to the village cattle in the summer months.

During the Second World War, the acute food shortage that developed inside the country led to the improvisation of a series of measures that were labelled as Grow More Food Campaign; and one of these measures consisted of bringing in additional land under cultivation of food crops. Sizable areas of culturable waste lands under public domain known as Darkasth lands were distributed to farmers who came forward to develop and cultivate these lands, with benefits of ownership rights conferred upon them. The result was a notable increase in the area of arable lands but a corresponding decline in the areas available for grazing since these culturable wastes served as grazing lands for the local livestock.

The policies pursued by the Governments-in-power after integration have been instrumental in a further contraction in the availability of grazing lands in the region (as elsewhere), and on a scale much larger than that under the grow more food campaign. As noted earlier, gomals (village commons) and kaval grounds were the most important features of the traditional system in ensuring liberal grazing facilities to the local livestock.

The new administration dispensed with the maintenance of the kaval grounds of the region consequent to the closing down of the once-renowned Amrut Mahal Cattle Farms in the District. Considerable portions of these lands were given away to private beneficiaries for arable purposes, and the remaining areas just abandoned. It is not known to what extent the original kaval grounds are still available for a programme of regeneration.

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The past three decades have witnessed the saddening spectacle of a general neglect of the gomals by the village panchayats to begin with and subsequent appropriation of these lands, in stages, for arable purposes by politically influential elements with the prior consent of the administration or otherwise. And in quite a few instances men in authority themselves have given away the gomal lands for housing the house-less or such other purposes.

The drying up of many of the tanks in the region owing to the general neglect in tank maintenance has had the effect of the drying up of the pasture grounds as well in the areas adjoining the tank beds. In the earlier times, the green pastures in the vicinity of tank beds were a source of exceptional benefit to the local livestock especially during summer months - a period of all round paucity in feed resources.

More recently, since the last fifties, the opening up of the Nugu Command Area has meant not only transformation of rainfed arable lands into irrigated lands but also land classified as culturable wastes that were being utilised for grazing purposes. This has again contributed to a shrinkage in the grazing resources, particularly in the taluks of H.D. Kote and Nanjangud.

The cumulative effect of all these factors has been a significant decline in the areas available for grazing in the region. The decline in the areas would not have been of consequence if measures had been instituted towards raising the productivity of the gross lands that remained. No such efforts, however, have been made.

The Opening Up of New Command Areas for Irrigated Agriculture:

The Nugu Command Area was opened up in the late fifties bringing some 20,000 acres, in stages, under canal irrigation in the taluks of H.D.Kote and Nanjangud. This has been a great gain to the region (not withstanding the fact that until an year ago not all the lands in the command area entitled to irrigation could enjoy conditions of certainty in respect of water availability). Thepositive benefit has been a substantial expansion in the area under paddy cultivation.

However the ecological destruction that took place in the process of transforming the lands for irrigated agriculture in this command area has hardly received attention. All the standing trees on the farmers' fields as well as waste lands (that were brought under irrigation)met with a once-for-all destruction; and the vast paddy fields are totally denuded of

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tree wealth today. It was noticed earlier that each one of these trees constituted an asset to the rural community in supplying food, feed, fuel, construction materials, and above all, green manure. It was further noticed that the foilage of honge and neam constituted the most precious green manure for the paddy fields. The farmers in this area have to cart long distances today in order to mobilise these leaves for manuring their paddy fields, and as a result, this valuable traditional system of manuring is fast disappearing to the farmers' detriment.

Given the Command Area Plan for opening up lands for irrigation, the "preparation" for operating the irrigation system not only involves excavation of land for major canals, minors, distributories and field channels but clearing the fields intended for irrigation of all vegetation, levelling these lands and terracing them. This means uprooting of all the standing trees, shrubs and other vegetative cover on the farmers' fields as well as waste lands that are brought under the irrigation net-work. This process is inevitable; but what is important is the institution of compenstory measures, almost simultaneously, that will not only make good the loss of tree wealth (caused by once-for-all destruction) over a reasonable time interval but add to the wealth in a meaningful form in the changed context.

The earlier irrigation systems were invariably accommpanied by such compensatory measures. The most spectacular witness to this past practice is the irrigation belt of Mandya District today.

It was in the early thirties that the Cauvery Dam at Krishnarajasagar and the irrigation network in the Mandya District (which was a part of the Mysore District in those days) were completed and Cauvery waters brought to the Mandya fields. And it is a glowing tribute to the enlightened administration of the Princely State of Mysore that simultaneously with the transformation of the dry tracts into irrigated lands, the farmers were guided and assisted by the administration in planting trees (of functional relevance) along the borders of the field channels that irrigated the fields of the respective farmers. Honge, Neam, gobli, casuarina, bamboo, woodapple, coconut and such other species were planted; and care was taken in spacing the planting of saplings in such a manner that fields on both sides of the field channels derived equal benefit. The perennial moisture of the soils along the borders of the field channels contributed to a speedy growth of these trees; and the waiting period in order to obtain yields on a sustaining basis was surprisingly short. To a passerby today the luscious tree cover of honge, neam, bamboo etc., along the borders of farmers' fields in the irrigated tracts of Mandya District is a refreshing sight, and to the farmer the advantages of commanding a wide range of farm inputs on his own farm are only too apparent. The greatest benefit to the farmer is the minimum dependence on purchased inputs and thereby largest retention out of the gross earnings of his farm produce..

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The lapse on the part of the administration in the more recent periods of instituting compensatory measures towards rebuilding (and judiciously augmenting) the ecological wealth lost in the process of opening up new command areas has to be explicitly recognised. The Nugu command area (probably like the other command areas in the State opened up in recent periods), denuded of all trees, bears a distressing contrast to the Mandya Irrigation Tracts. What is denied to the farmer of the Nugu area due to this lapse is strikingly brought out by taking a look at the advantages the farmers in the Irrigation Tracts of Mandya enjoy out of the ecological wealth on their farms.

The Introduction of New Technology in Paddy Cultivation

Traditional practices in paddy cultivation continued in the region practically until the end of sixties. In the old irrigation areas, modest in size, a certain constancy of yields in the neighbourhood of 15 quintals per acre were being maintained, with total self-sufficiency in farm inputs in respect of seeds, draft power, and green and organic manures. In the newly opened up Nugu irrigation areas, however, the cultivation was subject to severe constraints particularly due to the inadequacy and poor quality of the draft cattle (in relation to the total size of the paddy lands brought under cultivation). The processof achieving the necessary degree of tilth in the dry lands newly opened for wet cultivation necessarily involves considerable magnitude of effort, and then process is rendered more arduous when the draft stock is insufficient and poor in stamina. The enrichment of soils, again was subject to limitations both owing to the lack of easy access to leafy manure (for reasons mentioned above) and inadequacy of organic manure. The yields, therefore, were moderate in the neighbourhood of 10 quintals per acre.

Paddy,crop, however, was raised only during one season (June to December) in the agricultural year. In the summer months leguminous crops (mainly sun hemp) were sown, interspersed with a few pulses and oil seeds crops such as green gram, black gram, cowpea and gingelly, with the principal objective of green manuring the paddy fields at the time of transplantation.

It is in the early seventies that the waves of modern technology began extending into the paddy fields of the region - the introduction of high-yielding seed varieties, intensive dosage of chemical fertilisers, and control of pests through the spraying of chemical pesticides. The response of the farmers to the new technology has been a function of the financial means at their command. To the extent the government extension services and the banking system have been supporting these programmes, there has been a corresponding spread of the technology. The degree of improvement in the paddy yields however has been in direct relation to the extent the farmers are in a position to avail

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themselves of the new practices.

An understanding of the context in which the farmers of the region are adopting the 'new practices' is of the greatest importance. The extension service personnel propagate the new practices involving the use of chemical inputs on the assumption that the farmers are in a position to look after all the other requirements associated with the use of these inputs in order to obtain the expected high levels of yields. Among these requirements one is that the fields are adequately ploughed well in time for transplantation during the prescribed dates, and the other is that the fields are enriched with the prescribed quantities of organic (and green) manure. Chemical fertilisers are recommended 'on the top' of natural manure.

The reality in the region is that the available draft power is not commensurate with the needs of adequate and timely ploughing of all the paddy lands. Farmers in general are constrained to content themselves with the ploughing of the fields that is far from adequate; and the crisis in draft power is causing delay in transplantation, especially in the lands of the poor farmers, far beyond the outer limits of the prescribed season.

The other requirement on the farmers' part, namely enriching of the fields with 'prescribed quantitites' of organic (and green) manure, again, cannot be met by a large number of farmers in the region because of the overall shortage of organic manure (a corollary of the shortage of cattlestock) and the depletion of tree wealth (described earlier), a rich source of green manure.

It is not surprising that the paddy yields realised in the region in the range of 10 - 20 quintals per acre is far below the 'expected' yields (based on the levels attained in the experimentation farms of the government and universities under ideal conditions).

What is disquieting, however, is the effect that the wide exposure to the use of chemical fertilisers is having on the farming community of the region in the prevailing context marked by paucity of draft power and organic and green manure. Farmers have begun to react to the shortfalls in organic and green manure by reasoning to themselves that these shortfalls can be made good by a heavier dosage of chemical fertilisers. What would be the result of such a thinking on the part of the farmers is a question that those with scientific understanding and social conscience cannot afford to ignore.

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Encouragement to Double Cropping of Paddy

The mounting demands for rice on the part of the fast growing urban population in the southern states (and the chronic rice deficits of Kerala State) on the one side and, on the other, the possibilities opened up for raising a second paddy crop on the same lands (in an agricultural year) with the successful introduction of short duration (3½ months) varieties have been responsible for the promotion of double (and even more than double) cropping of paddy, wherever feasible, by the southern State Governments since the early seventies.

In the southern part of Mysore District, canal waters are being made available in the old irrigation areas (served by the Hullahalli and Rampur channels) sincemid-seventies for raising a second paddy crop (in the months February-May); and more recently even some parts of the Nugu Area are benefiting of the canal waters for the second paddy crop.

The progress achieved by the Southern State Governments in recent years in respect of increased rice production has been commendable; and this has been realised by a combination of a) enlarging the areas under canal irrigation, b) spreading the new technology, and c) promoting double (and even more than double) cropping of paddy.

However, double cropping of paddy on the same lands in an agricultural year could be endorsed with some justification under conditions of acute rice shortage, purely as a short term expedient. But the trend appears to be one of encouragement on a sustained basis, judged by the continuing support given to farmers through the release of canal waters, provision of extension services and supplies of fertiliser inputs and credit facilities for cultivating the summer crop. (In the summer of 1930, although exhortations were made to raise groundnut crop on the paddy lands, this had hardly any effect since adequate canal waters were released for paddy cultivation). It is most urgent to pause and reflect on the long term implications of this trend.

It has been seen earlier that the traditional cultivation of paddy was only in one season (June - December) in the region. Soon after the harvesting of paddy, the lands would be ploughed and allowed to dry in the sun. And with the first summer showers, the fields would be ploughed again and leguminous crops sown interspersed with pulses (green gram, black gram and cowpea) and oil seeds (gingelly) crops. The principal objective was one of raising green matter to be ploughed back into the fields at the time of puddling the paddy fields; but the supplementary gain in terms of harvesting the pulses and oil seeds was also of considerable significance. In years of good rainfall the quantities harvested

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of green gram, black gram, cowpea and gingelly were sufficiently important to meet the needs of the farmer families and also afford the families some modest cash income through marketable surpluses. The market arrivals of those pulses and oil seeds added up to sizeable magnitudes and largely met the demands in the big and small towns of the region.

The introduction of double cropping of paddy put an end to the raising of green manure crops. The season for the second crop ofpaddy being February - May and often extending into June, the lands that were being sun-dried and replenished of soil fertility through the sowing of leguminous crops are now being denied of these benefits and brought under mono-culture of paddy. The growing shortages of organic and green manures in the region have been noted earlier; and with the elimination of leguminous crops (under rotation) on the paddy lands, what is being practised is cultivation of paddy season after season with practically no natural means of fertilising the soils. Yields of paddy and nothing but paddy are being consecutively forced out of these lands with heavier and heavier dosage of chemical fertilisers (and the inevitable concomitant, the pesticides). It is common knowledge that yields of the second paddy crop are well below those of the principal crop, and over the recent years, paddy yields in general have been declining notwithstanding the increased resort to chemical fertilisers.

Moreover, the very process of augmenting rice supplies through double cropping has been instrumental for the shortfalls in the supplies of a few pulses and oilseeds, contributing to the imbalances in the composition of food supplies.

What becomes of paddy lands under mono-culture year after with practically no natural forms of soils replenishment and heavier absorption of chemical fertilisers and pesticides, and in what status lands inherited are being passed on to posterity are questions, once again, that those who combine scientific understanding with social conscience should address themselves to answer without delay.

The implications of year round flow of water in the canals also merits serious attention. In the earlier systems when paddy cultivation was undertaken only in one season (June-December), water ceased to flow in the canals by the beginning of January, and it was only in the beginning of June that water was again let into the canals. During the summer period, desilting of canal beds was undertaken regularly on an annual basis; and the silt removed from the canal beds served as a rich source of manure to be carted away by the farmers to their fields on payment of a moderate fee.

Double (and more than double) cropping of paddy has meant flow of water in the canals practically all through the year. There just does not exist the possiblity of undertaking the

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desilting operations in the canal systems. As a result, sidimentation is progressively thickening the canal beds and correspondingly the depth of the canal waters is getting reduced. And this is happening in a context in which the silt content of the run off waters that enter into the canals from both sides is getting heavier and heavier due to the thinning of the vegetative cover (for reasons noted earlier). The adverse impact of the silt accumulation in the canal beds on the maintenance of the irrigation systems in self-evident.

Progressive Enlargement of Dry Land Mulbery Cultivation

Although the beginnings of silkworm rearing and mulbery cultivation date back to the days of Tippu Sultan, the size of activity in this regard remained modest over a long stretch of time. In 1923-24 the area under mulbery in the entire Princely State of Mysore (essentially in the four districts of Bangalore, Kolar, Mandya and Mysore) was barely in the order of 30,000 acres, and the bulk of cultivation was under irrigated conditions. It was only in the black cotton soils of Chamarajanagar and T.Narasipur Taluks in the Mysore District that dry land mulbery had been developed over modest surfaces adding upto less than 10000 acres. The raw silk produced was being absorbed by the silk reeling and weaving cottage units in the adjoining areas of Yelendur and Kollegal (centres reputed for traditional silk fabrics). The picture remained almost unchanged until the late thirties.

Towards the end of 1937, under private initiative a modern fairly large-sized filatures unit was established in T.Narasipur, and this gave a big fillup to the spread of dry land mulbery cultivation in the surrounding areas. Thus began a new phase in the land use pattern as well as rural economic life of the region. Mulbery cultivation started taking over lands that were under ragi and jola.

It was most fortuitous that the Second World War broke out (in September 1939) soon after the Filature Unit went into production. The demands for silk filatures fabricated in the Unit shot up beyond all expectations, with the orders from the then Government of India themselves constituting the most important component. (Italy and Japan, the traditional suppliers of parachute silk to the British were in the opposite camp and the British had look/for alternate sources/to to procure parachute silk for their war needs. The quality of silk produced by the T.Narasipur Unit proved most satisfactory for the purpose). Domestic silk filatures enjoyed boom conditions inside the country with the cessation of imports from Italy and Japan. The Governments at the Centre and the State instituted a series of measures to stimulate expansion of silk filatures, the more important of them being special loans to the filature units and absorption of the entire production by the Government at the Centre at attractive prices. In 1940-41 a centre for improved foreign race

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silk worm seed production was set up in Biligiri Rangan Hills. Another silk filatures unit was installed in Kuderu in Chamarajanagar taluk. Silk filature production in the state went up from 2200 kg in 1937 to 136000 kg in 1944-45. The area under mulbery cultivation went up in the same period from 30000 acres to 80000 acres, practically the entire increase being confined to the dry lands of T.Narasipur and Chamarajanagar.

It is to the credit of the then government of the Princely State of Mysore that soon after the cessation of the war, measures were taken to check the expansion of mulbery, realising the implications of diverting the lands under staple grains for this purpose. However, the policy was short lived.

Soon after the integration of the Princely State into the Indian Union and the launching of 'planned economic development in the country, there was a revival of interest in expanding mulbery silk production; and since the First Five Year Plan period, the Governments at the Centre and the State have been vigorously pursuing a policy of expanding production. Over the past three decades, incentives and assistance for mulbery cultivation and silkworm rearing have been progressively strengthened.

By the end of the First Plan, in 1956 the area under mulbery cultivation in the State had reached a figure of 130000 acres, and as a consequence of the reorganization of the states and entry of Kollegal Taluk into Mysore District of the State, the total area under mulbery stood at 155000 acres in November 1956. The rates of increase in the area cultivated over the subsequent periods are as under:

Year	Area under mulbery (in acres)
1950-51	80,000
1956-57	155,000
1961-62	185,000
1968-69	200,000
1974-75	260,000
1975-76	268,000
1977-78	275,000

(K. Puttuswamiah: Loc.cit)

It is believed that currently the total area under mulbery in the State is of the order of 300000 acres.

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A massive programme (aided by the World Bank) for a substantial expansion of mulbery cultivation and silkworm rearing through extending these operations to the other districts of the state is reported to be in full swing.

What is important to note is that about three-fourths of the total area under mulbery cultivation is under rainfed conditions, and the largest concentration of rainfed mulbery is in the district of Mysore, especially in the taluks of T. Narasipur, Kollegal and Chamarajanagar.

Area under Mulberry: 1975-76

District	Area		
	Rainfed	Irrigated	Total
Mysore	159,232.5	5282.5	164 515.0
Bangalore	13,472.5	22385.0	35 857.5
Kolar	11,000.0	23200.0	34 200.0
Mandya	14,110.0	14110.0	28 220.0
Other districts	2,842.0	3345.0	6 817.5
	200,657.5	68,332.5	268,930.0

(Dept.of Sericulture, Government of Karnataka)

It is seen that in 1975-76 Mysore District alone accounted for about 165000 acres of land under mulbery out of a total of 269000 acres in the entire State (62 percent); and about 159000 acres out of this area (96 per cent) were under rainfed conditions.

Over the past four decades some 150000 acres of arable land that were being utilised earlier for cultivating ragi and jola (together with other food crops through inter-mixing and rotation) have been diverted to the planting of mulberry trees. One has to give serious thought to the implications of this development to the eco-system and rural life of the region.

In the specific context of the Southern Part of Mysore District, the focus would be on the Chamarajanagar taluk and the adjoining parts.

The following table shows the spread of mulberry over the past decade in the different taluks of the Mysore District.

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Area under Mulberry (in acres)

Mysore District

Sothern Part

Year	Chamaraja-nagar	Yelendur	Nanjangud	Gundlepet	H.D.Kota
1969-70	35 440	12 040	11903	3 858	-
1970-71	35 718	12 080	11880	3 943	-
1971-72	36 293	11 875	12328	4 080	-
1972-73	37 690	11 750	21443	3 620	-
1973-74	37 570	10 893	20463	4 983	-
1974-75	40 162	13 003	20865	5 625	-
1975-76	42 528	13 213	20315	6 200	-
1976-77	43 558	13 300	21500	6 813	25
1977-78	42 552	15 153	21575	7 170	16
1978-79	45 053	13 700	23525	7 525	25

Rest of the District

	Kollegal	T Narasipur	Mysore	Other Taluks
1969-70	25 925	23 908	2493	-
1970-71	26 398	24 475	2445	-
1971-72	26 700	24 523	2447	5
1972-73	26 700	25 338	2450	5
1973-74	23 460	26 135	2455	-
1974-75	37 028	28 800	4230	60
1975-76	32 198	28 398	4480	23
1976-77	32 495	27 400	4487	80
1977-78	30 098	27 400	3330	60
1978-79	35 073	27 613	3698	133

(Compiled from Data published by the Bureau of Economics and Statistics, Government of Karnataka).

(The irrigated component, as already seen, is hardly of significance. In 1978-79 the total mulberry area under irrigation just added upto 2274 acres: Yelendur - 1002 acres; Kollegal - 852 acres; T.Narasipur - 183 acres; and Chamaraja-nagar - 32 acres).

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The decade that is just over has witnessed not only sizeable expansion in the traditional mulberry areas of Kollegal, T.Narasipur, Chamarajanagar and Yelendur but an impressive thrust into the neighbouring taluks of Nanjangud and Gundlupet. The area under mulberry, entirely rainfed, have doubled in these taluks over the decade.

Given the pace and vigour with which the Department of Sericulture is developing the infrastructure facilities in Nanjangud Taluk in terms of government mulberry farms, grainages, extension services etc., and the attractive market prices for raw silk, it would appear that there would be a substantial spread of rainfed mulberry cultivation in the taluks of Nanjangud and Gundlupet, unless the process is effectively checked in time.

It is of vital interest to the people of the region to reflection the implications of this drift, that is being actively supported by government policies and programmes.

Yields in terms of mulberry leaves under rainfed conditions in the region are reported to be in the range of 3000-3500 kg per acre, in contrast to yields of irrigated mulberry of the order of 10000 kg per acre. Therefore, theoretically, the levels of existing mulberry production in the region could be realised on about one-third the existing area, if cultivation is undertaken under irrigated conditions; and two-thirds of the existing land under mulberry could be retrieved and utilised for other forms of agricultural activity. The proposition, however, is purely theoretical.

The fact is that some 90,000 acres of land that were earlier under ragi and jola (and associated pulses and oil seeds) are today committed to mulberry plantation under monoculture; and more and more of the arable lands of the region are being brought under mulberry. The plant is of the traditional variety suited to rainfed cultivation, with a life span of 15-25 years in distinct contrast to the new variety-M5 propagated in the irrigated areas, with a life span of 5 years.

Taking note of the remarkably high yields of irrigated mulberry in comparison with that under rainfed conditions, one would expect the official policy to consist of a phased withdrawal of rainfed mulberry cultivation as the areas under irrigated mulberry expand. However, the World Bank aided Crash Programme of the Union and State Governments for mulberry silk development does not envisage any such contraction of rainfed mulberry. It ispointed out that only the new plantations in other parts of the state would be under irrigated conditions. There is no indication either of any effective check on further expansion of dry land mulberry in the region. The evidence is to the contrary.

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At the macro-levels of the State Economy and the Economy of the Nation, the arguements advanced in defence of mulberry silk development are in terms of the gains achievedthrough industrialisation and export earnings. However in recent years, the export earnings of silk fabrics are ranging between Rs.5 to 6 crores whereas the annual value of raw silk produced in the State is of the order of Rs.80 crores. (K.Puttaswamaiah: Ioc.Cit. p.641 and p.672). Export earnings are seen to be a tiny fraction of the total value of silk produced in the state itself; and even the existing areas under irrigated mulberry could contribute towards more than doubling the export earnings.

It has to be explicityly recognised that an overwhelming part of the silk produced in the State is serving only the domestic markets. And therefore it is pertinent to examine the nature of demands that the industry is meeting by commiting such large areas of arable land under mulberry cultivation.

The end product viz., pure silk fabric is essentially an item of luxury consumption for the affluent in the country, largely concentrated in the urban centres. Pure silk fabrics are the highest priced among the different types of textile fabrics. The end product of the industry, itself, does not command any social priority (although markets for pure silk fabrics are reported to be enjoying boom conditions) and does not warrant diversion of land from uses that serve mass interests.

It is pointed out, however, that the industry commands itself from the point of view of the high employment and income generation in the mulberry growing areas, by promoting a series of forward linkages in the region itself. In addition to the direct employment in mulberry cultivation, sizeable employment opportunities are afforded in the subsequent phases of cocoon production and silk reeling (on charaka and cottage basins) in the rural homes. A recent study (1980 undertaken at the Institute of Social and Economic Change (ISEC) by Dr.A.R. Rajapurohit and Mr.K.V.Govindaraju, entitled "Study of Employment and Income in Sericulture presents an interesting analysis in this regard. Based on the survey conducted in a rainfed area in Chamarajanagar Taluk and an irrigated area in Sidlaghatta Taluk (Kolar District), the study has offered the following table (Page III) summarising the results:

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Employment and Income Generation Per Acre of Mulberry

	Rainfed Area		Irrigated Area	
	Employment Labour Days	Value added	Employment Labour Days	Value added
		Rs.		Rs.
1. Mulberry leaf production	44.17	1639	45.72	6313
2. Cocoon production	122.51		145.30	
3. Silk reeling on charaka	55.86	260	121.89	567
4. Silk reeling on cottage basin	47.73	783	99.23	1627
Total(1+2+3)	222.54	1399	312.91	6885
(1+2+4)	214.41	2422	290	7945

Total employment and income generated by cultivating mulberry on one acre of dry land viz., 214 labour days in an year and Rs.1899 (or Rs.2422) respectively are indeed impressive, especially in comparison with the corresponding figures for ragi cultivation viz., 41 labour days and Rs.322 (pages 40 and 61 of the study).

There is no denying that the handsome gross proceeds realised through the sale of pure mulberry silk fabrics at the final consumer point sets off cash flows all down the line, and after the absorptions at the higher levels (retailer, wholesaler, manufacture of fabrics and raw silk trader), sizeable cash flows descend to the mulberry region and get distributed to the persons engaged in silk reeling, cocoon production and mulberry cultivation in the region.

The benefits in terms of cash incomes to these persons and their families in the region are no doubt striking especially in comparison with those in the region engaged in other pursuits. The question, however, is what do these benefits of employment and money incomes represent in terms of real income and quality of living to the region.

It would be most meaningful to preface an answer to this question by reproducing the stimulating observations made in the introductory part of the ISEC study (page 9):

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"As a matter of fact, cotton crop in India during the pre-British period was providing employment to the cultivators not only at the crop growing stage but alsc at the crop processing stage. The cotton picked up by the women labour of the cultivators families was brought home and was cleaned and was further ginned by the same women using a crude wooden board and a wooden rod. Further, the cotton yarn was spun in the same household on a crude type of charakha by the women members of the family. Thus the employment generated upto the spinning stage at least was concentrated within the farm household itself. Even at the stage of dyeing and weaving cloth, the employment and income were generated usually in the same village among the specialised artisan classes. Probably this idea of cotton crop generating very high level of employment and income among the cultivators families influenced Mahatma Gandhi to uphold the cause of hand spinning and handloom weaving industries in the rural areas".

This admirable example of the forward linkages of cotton cultivation benefiting the rural families of the cotton growing region in terms of income and employment has the added merit of producing an end product that directly meets the basic needs of clothing of these very families and others in the region (as well as the needs of similar families outside the region). As against the income and employment generated through successive stages from cotton cultivation to production of cloth, there is a corresponding real income in terms of cloth output contributing to the welfare of the region.

Moreover cotton is a seasonal crop that enters into annual cropping patterns (in cotton growing areas) in rotation with other appropriate seasonal crops. And in the total cropping systems of a region, generally a meaningful coordination is established between cotton and food crops in land use planning.

Mulberry and mulberry silk present a totally different picture. The end product of the activities in mulberry cultivation, silkworm rearing and silk reeling has no relevance to the consumption needs of the region. The materials as well as labour effort of the region are utilised for final outputs that are absorbed elsewhere; but the benefit to those engaged in these activities in the region are in the form of money incomes. It is natural to reason out that apart from the direct benefit to these persons, the consumption demands emanating out of these money incomes should have in all round salutary effect on the region through the familiar multiplier process. The reality however in the rainfed mulberry areas is altogether different.

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Expansion of mulberry cultivation has taken place not by developing new virgin lands for the purpose. It has been brought about by planting mulberry on the dry arable lands that were earlier under ragi and jola. Farmers who are now growing mulberry and buying ragi or jola with their money incomes were raising ragi or jola on these very lands and were seiling the produce after stocking adequately for their family consumption. As the area under mulberry has gone on expanding, correspondingly the area under ragi and jola has gone on falling.

In Chamarajanagar Taluk, already the area under mulberry has surpassed the area under ragi and jola. In 1977-78, the corresponding figures were 33993 acres and 37663 acres. (Mysore District at a Glance 1977-78 - Bureau of Economics and Statistics). Over the past four decades, population of the taluk has more than doubled but area under ragi and jola, and correspondingly production, have halved, (Yields of millets under rainfed conditions have been stagnating at low levels all over the country). In recent years, the taluk is importing heavier and heavier quantities of foodgrains from outside to meet the market demands essentially emanating from those engaged in the expanding mulberry and raw silk sector.

Here is a situation wherein rising market demands for staple foodgrains are not only not being matched by rising supplies but the very factors accounting for rising demands are responsible for the falling supplies. Demands for foodgrains are rising because of expanding mulberry cultivation, and supplies of foodgrains are falling because of mulberry cultivation. And what is disturbing is that this phenomenon is fast spreading into the neighbouring taluks of Nanjangud and Gundlupet.

In the earlier section (pp 30-46), it was seen how intelligent the traditional systems of crop production were on the rainfed lands and how effectively pulses (red gram, broad beans, cowpea, horsegram and Bengal gram) and oilseeds (gingelly, niger, and groundnuts) were raised through inter-mixing and crop rotation on the ragi and jola fields. It was also seen how the green crop residues served as previous cattle feed and the dried residues as fuel. The expansion of mulberry cultivation under monoculture has meant not only a decline in the production of staple grains but of pulses and oil seeds as well.

Enthusiasts of regional specialisation might plead that the advantages of employment and income generated in the rainfed mulberry areas need not be given up as long as the food demands of these regions could be adequately met out of imports from other parts. This presupposes the availability of surpluses elsewhere. However, at the macro-level of the country itself millets, pulses and oilseeds production has been stagnating at low levels over several decades (in sharp contrast to wheat and rice).

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Production of Millets, Pulses and Oilseeds in India

(in million tonnes)

	1955-56	1960-61	1970-71	1975-76	1978-79
Millets	6.77	6.69	6.93	7.91	7.09
Pulses	11.71	12.73	11.82	13.04	12.17
Oilseeds*	5.50	6.87	9.26	9.91	9.55

*Groundnut, rapeseed and mustard, sesamum, linseed and castor-seed.

Per capita availability of pulses per day has fallen in the country from 70.4 grams in 1956 to 44.3 in 1979.

(Economic Survey Government of India 1979-80)

When a region which was at one time surplus in millets pulses and oilseeds turns into chronic deficit in a context where the country is facing shortages in all these the effect is only one of aggravating the shortages.

Generation of employment and income in rural areas in lines that do not add to the outputs needed by the people of the region but on the contrary brings about a fall in these outputs cannot qualify itself as a socially desirable policy. It is of the greatest urgency that men in authority reexamine the policy of continuing mulberry cultivation under rainfed conditions.

The most serious aspect of the spread of mulberry on the dry lands is its ecological implications in terms of the effect on soils. The variety suited to rainfed cultivation and propagated since long in the region is the one that has a life span of 15 to 25 years. The cultivation is under monoculture with no other plant species to be found on the vast stretches of mulberry land. The plant is deep rooted, descending to about 10 feet below the ground surface. The soils are treated annually with organic manure, but the supplies of organic manure are dwindling in the region. An increased application of chemical fertilisers is being encouraged to force higher yields in terms of leaves, which is harvested in entirely. Not a single leaf is left on the plant to dry itself and fall to the ground. There is just no possibility of mulching and humus formation, nature's mechanism of rebuilding and enriching soils. And the fact that the plant is deep rooted only means that the soil nutrients at deeper levels are being mined for feeding the leaves.

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These lands were for centuries being maintained in a rich state of soil fertility by the earlier generations with the cropping patterns and cultivation systems described earlier - characterised by mixed cropping and crop rotation, rich application of green and organic manures, rest to the soils and sun-drying of the soils periodically, and so on.

The lands are now under the monoculture of mulberry subjected to soils mining to promote an industry that is essentially intended for meeting the luxury consumption of the affluent. As early as in 1939 Jacks and Whyte wrote:

> "A nation cannot survive in a desert, nor enjoy more than a hollow and short lived prosperity if it exists by consuming its soil. This is what all the new lands of promise have been doing for the last hundred years, though few as yet realise the full consequences of their past actions or that soil erosion is altering the course of world history more radically than any after war or revolution.
>
> The new worlds could not have been developed without the help of foreign capital in the form of money, goods and services, most of which was paid for by exporting soil capital an apparently harmless procedure at a time when fertility was reckoned in terms of the inexhaustible supplies of plant-food minerals in virgin soils. Physically fertility was but little understood, still less was it realised that physical and biological characteristics were much more important forms of soil capital, more easily wasted and more difficult to restore than chemical characteristics".
>
> "Movements of capital have been an outstanding feature of the modern world. They may truly be said to have been one of the mainsprings of progress, but capitalism has never seriously concerned with its repurcussions on the humus content and structure of soils - Nevertheless the repurcussions have been shattering in their effect and can no longer be ignored."
>
> (The Rape of Earth - Faber and Faber, 1939)

What soil capital is being preserved on the rainfed mulberry lands to be entrusted to the posterity is a question that can be answered only by those that possess the scientific knowledge on the subject.

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Government indifference to Draft Cattle Stock and encouragement to cross-bred Cattle for Dairying.

The great merit of the traditional systems of resources husbandry in the rural parts lay in an intelligent understanding of the interdependence of man, animal and nature. Not only the ecological and animal wealth was conserved, judiciously exploited, and augmented but the very systems of crop production were evolved in a manner as to satisfy simultaneously the needs of food, feed, fuel and soils replenishment. Cattle played a pivotal role by supplying the energy inputs for ploughing, haulage and processing of harvests, fertility to the fields and milk to the farm families, and the ecological management as well as cropping systems looked after the feed requirements of cattle.

Until about four decades ago, these traditional systems were functioning in the region more or less intact, although subjected to severe strains in periods of drought. The region had a relatively small area under irrigation, and bulk of farming operations were on dry lands, essentially for growing food crops. The size of population was small; and in relation to population, the total area of arable lands was adequate to meet the food needs of the region. The size of cattlestock, again, was adequate to meet the farming needs. Although a large number of cattle were of indigenous non-descript stocks the efforts made by the government in supplying improving breeds to the farmers (as noted earlier) had substantially improved the composition of the cattlestock. The policies of the government in respect of forests and grazing lands and farmers own cropping systems together assured adequate cattle feed in normal years.

Since the early forties, however, the forces of change that have been analysed above in sequence have been producing a particularly adverse impace on the cattlestock of the region. The denudation of forests was the first element in the process of a progressive erosion of the feed resources base. (It was noted earlier that controlled grazing in forests lands constituted an important component of the grazing systems.) This was followed by the appropriation of koval lands for arable purposes and neglect of the remaining portions as well as the encroachment of village go-mals, further contracting the areas under pastures; and the neglect of the tank system and the drying up of tank beds meant the disappearance of the luscious pastures in the vicinity of tanks (which were of great benefit especially in the summer months).

Subsequently, the development of lands for irrigated agriculture in the Nugu Command Area, in the taluks of Nanjangud and H.D.Kote, led to the absorption of some parts of cultivable wastelands (that were being grazed earlier) into the irrigation system and a once-for-all destruction of all the standing trees on the fields that came under irrigation (of which, the fodder trees were an important component).

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The cumulative effect of all these factors has been a significant contraction in the areas available for grazing in the region. And on the lands that have remained as grazing lands, there has been the inevitable "overstocking" and over-grazing with the result that lands are severely degraded.

Parallel to the contraction and degradation of the grazing lands, the region is being faced with growing shortages in feed resources through crop production. The sharp decline in the areas under ragi and jola (consequent to mulberry expansion) has meant a corresponding decline in the availability of ragi straw and jowar stalk - the staple stall feed of the cattle in the region. Also a fall in the supplies of horsegram, the only major protein feed for the local cattle. There has been an increase, however, in the availability of paddy straw but not to the extent of compensating for the fall in ragi straw and jowar stalk.

The growing paucity of cattle feed is in the context of an increasing need for the draft animal by the farmer. The ISEC Study points out the problems the mulberry growers are facing in respect of their draft power and organic manure requirements. But the situation in the paddy areas is even more critical. The feed availability to the existing cattle stock is grossly inadequate (especially in the summer months) and the farmers are making use of their half-starved animals and carrying on with the poor productivity of the animal. But the size of the cattlestock itself is utterly insufficient to meet the needs of paddy cultivation. The transplantation operations are being stretched beyond the outer seasonal limits due to the paucity of the draftstock, with the inevitable adverse effects on yields caused by delayed transplantation, and the Eighties are going to witness the opening up of the Kabini Command Area bringing in larger and larger areas under paddy cultivation.

The indifference on the part of the state towards, stabilising and augmenting the feed resources for the existing cattle stock, improving the stock and augmenting the size of the stock stands in sharp contrast to the measures pursued with vigour in respect of promoting the use of high yielding seed varieties, chemical fertilisers and pesticides. These "modern inputs" would of of little avail if the crucial input energy for ploughing is becoming scarcer and scarcer.

In this background, the attention that is being paid to encouraging the maintenance of high milk-yielding cross-bred cows in the rural areas of the region is difficult to understand. As things stand today, this operation appears to be entirely oriented to meeting the urban demands for milk and milk products. The animal has the sole function of yielding large quantities of milk and is fed only for this purpose. The

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male progeny is just abandoned, and this sector has no linkages with the rest of the rural economy but lays claims on the feed resources of theregion that are already in short supply to meet the needs of the indigenous cattle that are so precious to the rural economy. In the overall context of rural development for the benefit of the people of the region, whether this operation should continue in its present form is a question that presses for an answer.

Large-sized Industrial Undertakings Enjoying Access to Forest Resources and Crop Residues of the Region:

The region's bamboo resources have already been severely depleted with the inroads into the Mysore District made by the Harihar Polyfibre Unit, and the local basket makers are hard put to survive with the bamboo resources of their own region getting out of their reach.

Close to Nanjangud Town, along the banks of the Kabini River are located several paper manufacturing units, some in production and others in the process of construction. It is not known precisely what claims of these units on the forest resources and crop residues of the region have been officially endorsed by the Government. One of these units is absorbing in sizeable quantities ragi straw, a vital element of cattle feed that is already in acute short supply. And another unit is based on the processing of elephant grass (harvested in the Himavat Gopalaswamy Range) as well as paddy straw of the region into paper. It is hoped that the exploitation of elephant grasshas been permitted in the framework of a carefully conceived forest restoration and management policy.

In respect of paddy straw, however, absorption by the industrial unit of this material that is in short supply relative to the needs of the existing cattlestock is already pushing up prices causing severe hardships to the poor farmers of the region. It has been noted earlier that the existing cattlestock is half-starved and improving the feed supplies is of the greatest urgency in the very interests of improving food production. And with the additional areas coming into irrigation over the coming years, one has to envisage a significant expansion in the requirements of adequately fed cattlestock. In this perspective, it is imperative that a careful review is undertaken of the measures in progress in this region with regard to industrial expansion in lines that lay claims on crop residues.

In the recent years, there has been an impressive expansion in the plantation of eucalyptus in the region as a forest policy, and a sizeable part of the plantation is oriented to serving the industrial needs for manufacturing synthetic fibres and paper. It is for the technically knowledgeable to assure that the more important policies concerning the regeneration of natural forests in order to restore the ecological balance are not being jeopardised by the massive expansion of industrial eucalyptus that one witness in the region.

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Ecological Imperatives

The major gain to the resources endowment of the region in the recent period has been the sizeable expansion of irrigational facilities; and the Eighties are going to witness substantial additions to the irrigated area with the opening up of the Kabini Command Area. As against this, one has to take note of the serious erosion in the ecological resources base of the region with the denudation of forests and the shrinkage and degradation of cattle-stock, and spread of monoculture - paddy in the irrigated areas and mulberry on the rainfed lands.

Rebuilding and strengthening of the ecological resources base of the region with meaningful utilisation of modern advances in science and technology, augmenting the cattlestock and raising its productivity, and reorienting the cropping systems in a manner that serves the social interests while adhering to the ecological imperatives are the tasks that those who have drawn upon the resources of the region during the past four decades have to take upon themselves in the interests of sustained well-being and progress of their prosperity.

"Until recent times most of what was taken out of the soil was returned. Natural plant communities took the substances essential for life from the soil and air and used them, with the energy of the sun, to manufacture organic materials, which provided feed for a long chain of herbivores and carnivores. Little was lost, and at various stages materials were returned to the soil or air or water. As plants and animal died, decay liberated the nutrients for plant rouse. It was and is a balanced cycles one would keep going indefinitely on an earth where the resources are limited".

"Now that man is practising industrial agriculture, the crops - the single species crops - take a tremendous weight of nutrients from the soil. And these nutrients are not returned, as they are when plants die;....

"In a world where the losses are becoming serious, the problem is how to maintain the diversity that remains and to restore it where it has been reduced. If a species is totally gone, as is the dodo, no restoration is possible".

"If agriculture is to provide food for the future and if the earth is to continue to support human life, all of the ecological imperatives must be taken into account".